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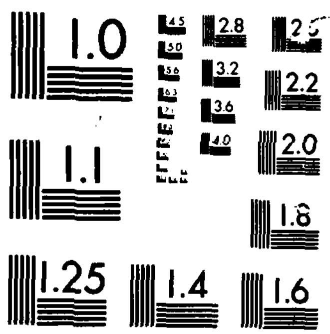

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MAGTF DATA TRANSFER ALTERNATIVES (1986-1996)

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THE FOCUS OF THIS STUDY DETERMINED OPTIMUM AND ALTERNATIVE DATA TRANSFER CONFIGURATI FOR ADPE FMF AND OTHER END USER COMPUTING EQUIPMENT (EUCE) IN SUPPORT OF THE MARINE AIR GROUND TASK FORCE (MAGTF) COMMUNICATIONS REQUIREMENTS BOTH INTERNAL AND EXTERNAL TO THE AMPHIBIOUS OBJECTIVE AREA (AOA).

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RD/CCT
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31 MAR 1986

From: Commandant of the Marine Corps

Subj: MAGTF DATA TRANSFER ALTERNATIVES (1986-1996) STUDY

1. The objectives of the study were to determine the optimum and alternative data transfer configurations for ADPE-FMF and other End User Computing Equipment (EUCE) in support of the Marine Air Ground Task Force (MAGTF) communications requirements both within and external to the Amphibious Objective Area (AOA).

2. The objectives were met by this study and the format of the study gives planning data and suggestions for improvement of data communications into and out of the AOA.

3. The results of the study are concurred in.

4. A copy of this letter will be affixed inside the front cover of each copy of the subject study report prior to its distribution.

Ray "M" Franklin

RAY "M" FRANKLIN
Major General U.S. Marine Corps
Deputy Chief of Staff for RD&S

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EXECUTIVE SUMMARY

S-1 Introduction

S-1.1 Objective. To determine optimum and alternative data transfer configurations for ADPE-FMF and other End User Computing Equipment (EUCE) in support of the Marine Air Ground Task Force (MAGTF) communications requirements both within and external to the Amphibious Objective Area (AOA).

The study's purpose was

S-1.2 Purpose. To determine what impact the introduction of Automated Information Systems (AIS) into the AOA will have on the Landing Force Integrated Communications System (LFICS).

The study sought to

S-1.3 Scope. Determine what communications requirements exist for AIS support of deployed MAGTFs, and Identify shortfalls and solutions and determine optimum and alternative data transfer plans for the selective transmission of data in accordance with priority and circuit availability.

S-1.4 Background. The principal factors bearing on MAGTF data transfer options are the architectures and concepts of operation of the AIS and LFICS resources.

Marine Corps C4 systems have been developed under a unifying concept which was structured to:

- Reduce distinctions between FMF and supporting establishment AISs

- Make FMF and Supporting Establishment AISs subsets of Marine Corps-wide systems

- Reduce distinctions between AISs and Tactical Data Systems (TDS)

- Develop a digital communications system with extensive common user, switched, multichannel capability that is virtually transparent to user requirements

The Marine Corps has been in a long term process of automating its major management and selected tactical command and control functions. In 1980 the deployed concept was expanded to include the administrative and logistic functions necessary to sustain combat operations. That effort began with the issuing of 552 ruggedized IBM Series 1, ADPE-FMF, equipments to FMF units down to the battalion, squadron and separate company levels.

The function of the ADPE-FMF equipment is to provide a deployable data processing capability that is interoperable with the major Class I AIS garrison systems. This will allow AOA operations of the financial, personnel, logistics, and readiness systems which are essential to sustained operations of the deployed forces.

The program has been a success and a 1982 post-implementation review concluded that additional devices were required. To meet this need, the End User Computer Equipment (EUCE) program was initiated with initial deliveries scheduled for FY87. In addition to the EUCE effort, a product improvement program will upgrade the original 552 and additional ADPE-FMF equipments with increased memory and communications capabilities. This will allow on-line networking of the ADPE-FMF and EUCE devices with their supporting AIS computers.

Major AISs are being redesigned to support interactive data base operations. This includes systems necessary to assure sustained operations of deployed MAGTFs. Although emphasis to-date has been on garrison operations, they set the stage for deployed requirements.

Concurrently, prototype Deployable Force Automated Services Centers (DFASC) are being operationally evaluated. The results of the evaluation will be used to specify requirements for a follow-on, larger inventory of Marine Air-Ground Task Force Automated Services Centers (MASC). The DFASC, followed by the MASC, will provide the MAGTF Commander with a capability to sustain major AIS functions in the AOA.

In order to derive maximum utility from the DFASC/MASC and ADPE-FMF/EUCE resources, it is necessary to have them interconnected through a communications network. In garrison, the Marine Corps Data Network (MCDN) provides this connectivity. In the AOA it will be provided by the LFICS. This is a departure from previous concepts where the principal method of AIS data transfer in the AOA was by messenger carrying magnetic tapes and diskettes.

S-1.5 Mode. Two modes of analyses were used. In the requirements mode, data transfer needs were developed without regard to resource limitations. In the subsequent capabilities mode, the needs were compared to the available communications resources.

S-1.6 Methodology. Four methods were used: research, interviews, scenario development and systems analysis.

Previous studies on the subject of ADP and teleprocessing support in the FMF were researched to assure continuity of the evolving requirement. Interviews were used to assure consideration of subsequent developments. FMF manuals and an approved operational scenario (MARCORPS 1A) were used to assure that the analysis and projections were within the context of current doctrine. Systems analysis was conducted using the Command and Control Master Plan (C2MP), the Marine Corps Technical Interface Concept (TIC), and the Technical Interface Design Plan (TIDP) as the basis for system configuration and interface.

S-2 Scenario. The 1A scenario represents one of the more complex in terms of communications requirements. It was used, as is, except for the addition of the recently formed Light Armored Vehicle (LAV) Battalion and the Target Acquisition and Control Battery units. The most recent MMROP figures were used to assure that the troop population would reflect these and other changes. Section 2 describes the scenario application.

S-3 FMF Automated Systems. Representative communications, tactical data and automated information systems which will be deployed with the MAGTF are described in sections 3 and 5. Table ES-1 identifies the AISs which will be supported by the ADPE-FMF and the DFASC/MASC equipments. TDS and AIS resources will coexist and use the same LFICS communications network in the AOA. It is therefore essential that they be measured in identical terms in order to accurately assess the aggregate impact. Section 4 describes the AISs which impact on data transfer requiremen s.

S-4 Information Transfer Requirements. Gross estimates of data transfer requirements can be made on the basis of force structure and troop population. Eventually, however, requirements must be more accurately defined by functional analyses. This is essential to verify traffic loads and flow patterns in terms of points of origin, transition and destination.

During the analysis of previous studies it became obvious that there is a need for a standard way of identifying and quantifying data transfer requirements. It was equally apparent that the AIS functions and data transfer requirements closely parallel those of the TDSs which have already been functionally defined in terms of operational facilities or, "OPFACS", in the TIC and the TIDP.

CURRENT	CATEGORY	FUTURE
SASSY	LOGISTICS	M3S
MIMMS	LOGISTICS	M3S
SEMS (CAEMS)	LOGISTICS	CAEMS
3M	LOGISTICS	NALCOMIS
SUADPS	LOGISTICS	SUADPS - RT
FREDS	READINESS	FREDS
JUMPS/MMS	FINANCE/MANPOWER	REAL FAMMIS
UNIT REP	READINESS	UNIT REP
MAGFARS	FINANCIAL	SABRS
DOV	DISBURSING	DOV
MAGTF LIFT I	LOGISTICS	MAGTF LIFT II

Table ES-1. Deployable Automated Information Systems

Section 4 therefore, develops a concept of "AISOPFACS" and proceeds to create top-level Multiple Agency Sequence Diagrams (MASD), which provide an initial methodology of defining MAGTF AIS operations in the same manner as the TDS and their OPFACs. This is necessary in order to provide a common basis for definition and evaluation of systems which must eventually interoperate.

S-5 Communications. Electronic data transfer alternatives are governed by the availability and capacity of the communications system. The resources available for AIS data transfer in the AOA are provided by the LFICS. Demands on the system are generated by the functions and locations of the OPFACs and AISOPFACs. Capabilities are a function of the equipments. Availability depends on the allocation of equipments to the facility, their locations in the AOA and on the progress of establishing the LFICS network ashore. Section 5 describes selected equipments in terms of interface requirements, functions, initial operational capability and allocation to C2 nodes in the AOA at key points during the assault.

S-6 Communications Configurations. As operations ashore proceed, the communications network begins to form. It begins with a single channel radio network on D-Day and evolves into a complex multichannel network with nodes at virtually all of the MAGTF command posts by the D+11 phase when the total landing force is ashore. Section 6 describes this evolution of the LFICS in terms of the capabilities at key nodes during the D-Day, D+5 and D+11 phases of the operation. Both single and multichannel configurations are developed. However, the multichannel network is emphasized in view of it being the primary means of data transfer.

S-7 MAGTF AIS Data Transfer Alternatives. Alternatives for transfer of AIS traffic within, and external to, the AOA are: (1) manual transfer with messengers carrying magnetic or paper media and batch transmission to DFASC/RASC. (2) A theoretical optimum of direct, on-line communications between ADPE-FMF terminals and a RASC outside the AOA. (3) Between those extremes is interactive communication between terminals and a DFASC in the AOA with batch transfer between the DFASC and a RASC outside the AOA. The alternative of on-line connection between AOA terminals and a RASC outside the AOA is technically possible, however, it is theoretical at this time because of the availability of satellite channels and higher priority demands in the 1986-1996 period.

Section 7 explores these options and selects a combination of alternatives 1 and 3 as the most realistic data transfer plan given the characteristics of the amphibious operation, available communications and AIS architecture. The messenger alternative is optimum as the start-up and back-up method of data transfer when electronic systems are not available. This provides baseline AIS support while the communications network is being established or displaced and constitutes the mandatory, manual back-up capability. It also easily evolves into use of the DFASC as an AOA RASC as the LFICS network expands to support it.

Data Transfer alternatives are then evaluated in terms of the principal means being single channel radio with the DCT at the battalion level and the switched multichannel system for echelons above battalion. Within this context, AIS needlines and flowlines and comparisons of the flowline requirements to the available communications are developed.

S-8 Conclusions and Recommendations

The following conclusions and recommendations were developed to assist in the development of optimum and alternative data transfer methods for the MAGTF:

S-8.1 AIS facilities are colocated with TDS operational facilities (OPFACS) and share the same telecommunications network (LFICS) and other AOA resources. It is necessary that they be considered jointly and in common units of terminology and measurement in order to determine their aggregate requirement and impact on resources. It is therefore recommended that the AIS facilities be designated as AISOPFACs and that they be included in the TIC, TIDP and TSP documents as an initial step of integrating these requirements.

S-8.2 Multiple Agency Sequence Diagrams (MASDs) are a structured method of determining and displaying information flow and exchange requirements. They are developed in the TIDP for TDS OPFACS only. MASDs are equally applicable and necessary to AISOPFACS. Top level MASDs were developed for the 14 AISOPFACS identified in the study. Figure ES-1 is an example of a top level MASD for the Casualty Reporting Function of the proposed Administrative Control Unit AISOPFAC. It is recommended that the AIS MASDs also be included in the TIC and TIDP and in the Telecommunications Support Plans for AISs.

S-8.3 AISOPFAC Information Flow Requirements are derived from a variety of determinants including force structure, troop population, and AIS concepts of operation. Initial estimates are made by systems engineers. Sections 4 through 7 present manually derived flow requirements in the form of MASDs,

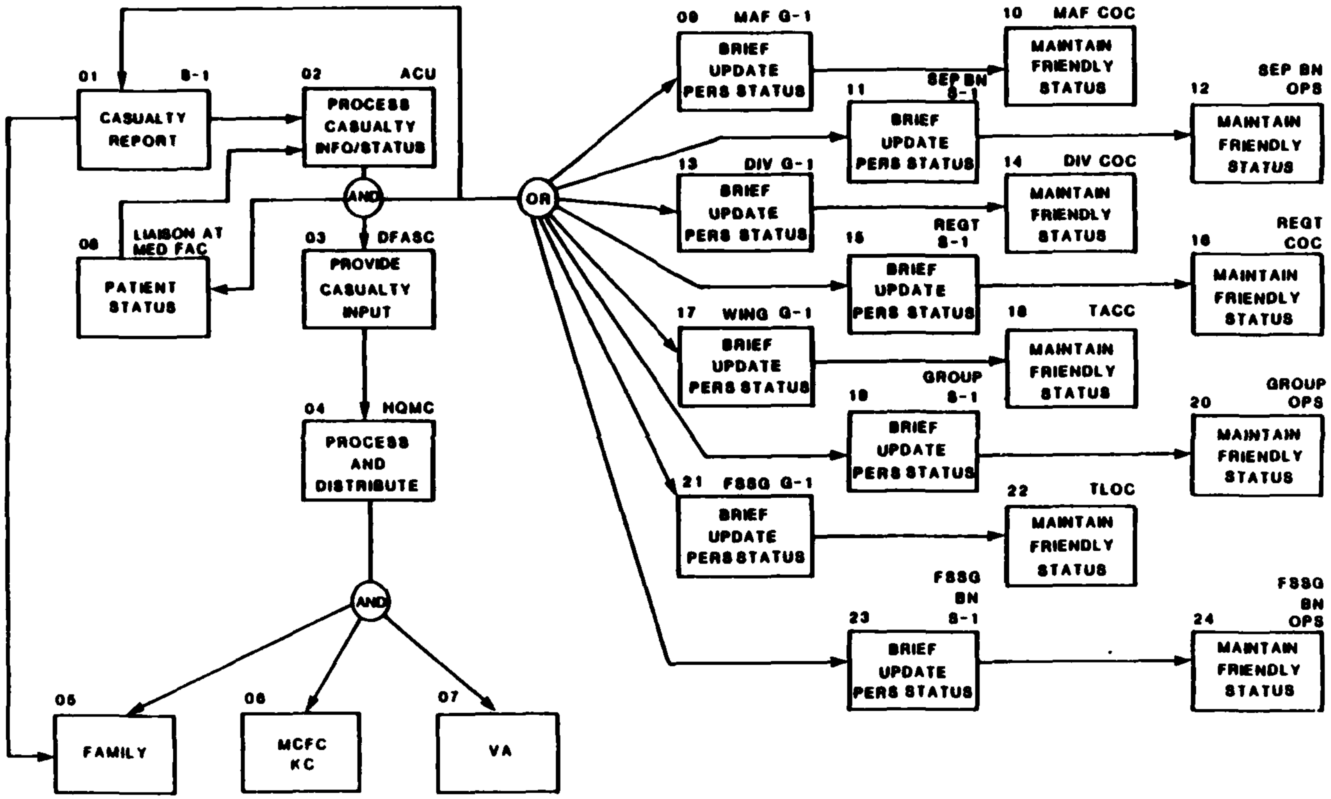

Figure ES-1. MASD for Casualty Reporting

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needlines, flowlines, volumes and channel availability. Second order estimates should be based on actual operations or exercises with emphasis on data collection. Third order analysis should then be made on computer models to test extremes which cannot be accomplished in exercises.

It is recommended that testing of existing systems be initiated through development of Telecommunications Support Plans (TSP) as required in MCO P5231.1 and used in exercises. Computer modeling is addressed in 8.12.

S-8.4 Communications needlines, or the need for connectivity between two points, were developed from the MASDs. Based on the needlines and the scenario, flowlines were developed to show the communications path taken to satisfy the needlines. The MASDs and flowlines identify the points of coexistence and intersection of AIS and TDS information. The diagrams indicate that AIS and TDS traffic coexist at virtually all C2 nodes. It is recommended that both the LFICS and TDS architectures and operational models be modified to reflect this coexistence.

S-8.5 Estimated information exchange requirements between TDS OPFACS and AISOPFACS were developed based on the MASDs, needlines and flowlines. More accurate information should be obtained through the development of Concepts of Employment (COE), and TSPs for the AIS and subsequent exercise of the systems.

S-8.6 Optimum equipment suites for EUCE data transfer were developed based on current and planned communications assets. The planned 1986-1992 LFICS configuration is adquate with exception of multichannel links between the division and regiment nodes. Additional and modified AN/MRC-135 equipments are recommended for the near term. Introduction of the AN/MRC-139 will

resolve the deficiency ashore in the 1992-1996 period. However, it is even more line-of-sight limited than the MRC-135. This will create a serious range deficiency in the ship-to-shore capability which will worsen with over-the-horizon ship standoff distances. At this time, the AN/MRC-135, modified for 16 Kbps channels, still remains as the only ship-to-shore alternative and its viability is questionable at standoff distances of over 15-20 miles.

S-8.7 ADPE shortfalls were identified in the DFASC capability, EUCE procurement and use of the ADPE-FMF and DCT. It was recommended that the DFASC FEP be upgraded to handle more communications lines and protocols. It was also noted that the CPU would also have to be upgraded to handle the DBMS oriented SASSY/MIMMS and JUMPS/MMS/REAL FAMMIS data bases. In the case of the EUCE, the acquisition should be reoriented to assure a more structured ILSP and communications configuration control effort. Use of the ADPE-FMF as a communications control device is also proposed to increase its life cycle and control EUCE communications demands. Finally, the utility of the DCT and the MAGTF AISs would be increased by use of the DCT in selected AIS functions.

S-8.8 Optimum and alternative MAGTF AIS communications circuit configurations are available through a combination of the switched multichannel system being the primary means and the alternative being the single channel network using DCTs in a limited AIS role. This takes advantage of the flexibility of the multichannel system in a common user mode and of the surviability of the single channel network when the full LFICS capability is not available. External AIS communications circuits will remain at premium and should be enhanced by providing a Defense Data Network compatible X.25 protocol capability in the DFASC Front-End Processor and in the planned Tactical Communications Center.

S-8.9 Existing and planned switching and relay equipments can provide necessary AIS communications with the exception of a dial-up capability which is necessary in common user applications. This method of access has been used in IMAF and documented by the Naval Ocean Systems Command. Devices currently on the market offer circuit conditioning and access control as well as the required dial-up connectivity. A program to provide dial-up modems for ADPE-FMF and EUCE is recommended.

S8-10 Switching compatibility problems exist in the area of FEP and TCC access to the packet switched DDN. Recommendations were made in paragraph 8.8 to provide an X.25 protocol capability in both equipments.

S8-11 Data files of ADP equipment in use in AISOPFACS by node have been prepared and are forwarded under separate cover in magnetic disc form.

S8-12 The report constitutes a Data Transfer Plan for the pre-MTACCS and MTACCS eras and in three time phases for each era. Although 1A Scenario oriented, the plan is also generic because of being designed around the doctrine and techniques contained in current FMFMs and MCDEC programs of instruction. Deficiencies exist in the lack of common information exchange standards and units of measurement and a computer model to test manual traffic analyses and simulate extremes which cannot be duplicated in exercises. Programs are underway at MCDEC to resolve these issues and should be continued under C^4 Division sponsorship.

S-8.13 Doctrinal deficiencies were identified in the areas of Concepts of Employment (COE) for AIS, artificial separation of AIS and TDS operations, and in manpower oriented AIS support in the MAGTF. It is recommended that COEs with supporting AIS Operations and TSPs be developed to support

further development of the AIS and as initial steps in developing MAGTF AIS operational doctrine. It is also recommended that the COEs and plans be used as the basis for using existing systems in exercises to develop second order traffic analysis information and to refine the documents. Approval of the concept of AISOPFACS and their inclusion in planning documents such as the TIC and the TIDP are recommended as initial steps in removing the artificial separation of the TDS and AIS operations in a MAGTF. It was also recommended that a deployable systems support activity, in the form of an Administrative Control Unit, be established at the MAF level to support the flow of casualty, replacement, unit diary and other manpower functions in the AOA.

S-8.14 Table 8-1 lists 14 required actions and suggested milestone dates to accomplish the above recommendations.

SECTION 1. INTRODUCTION

1.1 Background

In 1980, the United States Marine Corps began to equip Fleet Marine Force (FMF) units with ruggedized IBM Series I minicomputers. Their function was to automate data entry capability into Marine Corps Class I Automated Information Systems (AIS) and to support FMF Class II and III requirements as defined in MCO P5231.1. This equipment was deployed down to the battalion/squadron level. Transfer of data from computer to computer was, and generally continues to be, by means of courier using floppy discs. In 1982, a post-implementation review concluded that additional devices were required to meet the growing data processing requirement within the FMF. To meet this need, an End User Computer Equipment (EUCE) program was initiated. Initial delivery of EUC equipment is programmed for FY87. In addition to the EUC program, a product improvement program is under way to upgrade the 552 existing ADPE-FMF devices currently in use. When upgraded, these devices will have memory expanded to 128K. A Binary Synchronous Communications (BSC) capability will also be added. Two planned procurements of ADPE-FMF devices will have these characteristics.

Operational Testing and Evaluation (OT&E) of a Deployable Force Automated Services Centers (DFASC) is ongoing and will be completed in FY86. The results of these tests will be used to determine the requirements for a Marine Air-Ground Task Force Automated Services Center (MASC) which will eventually replace the DFASC. The DFASC, followed by the MASC, will provide the MAGTF commander with an ADP support capability when deployed.

In addition to existing requirements, the Marine Corps has been redesigning Class I AISs from a batch-oriented nature to an on-line Data Base Management System (DBMS) orientation, with computer work stations accomplishing the data input and output functions. The current conversion to the new AISs is an evolutionary process and will be completed by 1989.

With the increasing commitment by the Marine Corps to automate administrative and management functions, the need to transmit data via electronic means between computers has become more intense. Data transfer requirements are expanding rapidly and placing an intensified demand on the various telecommunications systems. The Marine Corps Data Network (MCDN) was developed in response to that need and provides terminal-to-computer and computer-to-computer communications for the supporting establishment and for FMF units in garrison. Communications to and from deployed units is now off-line via AUTODIN using the AN/TYC-5A Data Communications Terminals while ashore and the Navy Communications System while afloat.

1.2 Study Purpose

The purpose of this study is to determine optimum and alternative data transfer configuration for ADPE-FMF and other notional EUCE in support of a Marine Air Ground Task Force (MAGTF) based on inter-and-intra Amphibious Objective Area (AOA) communications requirements.

1.3 Study Objective

The objective of this study is to provide a basis for assessing the impact of EUCE employment concepts, supportability and basis for Landing Force Integrated Communications System (LFICS) architecture revisions during the 1986 to 1996 time frame.

1.4 Study Assumptions

The study began in September 1984 with six assumptions. During the research phase these assumptions were validated and revised. The assumptions agreed upon by the Marine Corps are:

Mission. The mission outlined in the Marine Corps Long Range Plan (MLRP) will remain substantially the same.

Scenarios. The MARCOR 1A scenario used for the Intelligence Communications Requirement Study and the MCTSSA Landing Force Communication System Loading Analysis is the the scenario to be used in this study in order to provide a common operational base.

Force Structure. The current force structure defined in the Marine Corps Mid-Range Objective Plan (MMROP) will be effective through the 1986-1996 period.

Automated Information Systems (AIS). End-User-Computing-Equipment (EUCE) will be available in sufficient quantities to support all missions outlined in existing AIS concepts.

Transmission Media. Current and future capabilities addressed in the current Command and Control (C^2) Master Plan will be available and fielded on schedule.

Communication Security. Communications Security (COMSEC) equipment will be available and compatible to cover all system media paths.

Studies and Analyses. The C^2 Master Plan, Intelligence Communications Study, and the Landing Force Integrated Communications System Loading Analysis contain valid information for the purpose of establishing baseline traffic loading.

AIS Information Flow. A need exists for the electronic transmission of MAGTF AIS information to enhance the sustained combat power of MAGTF's. The means employed and priorities will vary between war and peacetime conditions.

Combat Power. Combat endurance of MAGTF would be diminished without a deployable automated processing capability.

1.5 Study Mode

There are two modes in which a study may be conducted. In the requirements mode needs are stated with no constraints on resources to satisfy the needs. In the capabilities mode resources are constrained and the needs are compared to the capabilities. This study considered both modes. To determine the optimum data transfer configuration the requirements mode was utilized. To determine alternatives the capabilities mode was used.

1.6 Study Methodology

1.6.1 General. The four methods used to conduct the study were: research, interviews, scenario development, and systems analysis.

1.6.2 Research. An extensive research effort was conducted over the course of the study into a variety of orders, bulletins, Fleet Marine Force Manuals, plans, programs, and previous studies. Appendix A identifies the

material that was used for this effort. While the majority of the material researched proved beneficial to the study effort, three studies provided a background and foundation for the effort.

1.6.2.1 The Stanford Research Institute completed a study in 1977 entitled "Alternative Automated Data Processing System Concepts for Support of the FMF (1980-1990)." The study concentrated on administrative information processing associated with management of manpower, operations, and logistics activities of the FMF rather than the tactical control activities. The study was used as the basis for identifying functions for the various automated information systems operational facilities.

1.6.2.2 The Potomac General Research Group (PGRG) completed a study in 1980 entitled "Marine Air Ground Task Force (MAGTF) Teleprocessing Requirements Study." The study quantified channel usage requirements for LFICS multichannel equipment for a deployed MAGTF.

1.6.2.3 PGRG completed a study in 1982 entitled "Automated Information System (AIS) Support for FMF Units When Deployed in Combat (1985-1995)." The study considered and documented the importance of AISs in a deployed environment. It applied AIS requirements to telecommunications capabilities based on a scenario and recommended:

- That deployable AIS functions be processed on a deployed MASC

- That emerging AISs be modularly designed so that deployable versions could support a MAGTF

- That the deployed manpower data base on the MASC be updated at the time transactions are processed for transmission or transport from the deployed MAF or MAB

1.6.3 Interviews. The interview process was used extensively throughout the study to update research material and to collect data to be used in the final analysis. Information was gathered by personal interview and the use of a questionnaire.

- Questionnaire - a questionnaire was developed to determine current employment practices for existing AISs. This method proved to be of a marginal value since it was learned during field visits that Class I AISs are not deployed or planned for during current field exercises. Recent actual operations such as Beirut and Grenada were MAU size and, while no ADP annexes to their Operations Orders were prepared, personnel who participated were able to complete the questionnaire in relation to a MAU size operation.

- Personal Interviews - personal interviews with functional managers and communications electronic and ADP personnel at all levels of command provided insight into current planning for AIS deployment. Field visits revealed a proliferation of various microprocessors used to supplement ADPE-FMF usage.

1.6.4 Scenario Development. The Marine Corps IA Scenario was selected for use in this report because of its use in other ongoing studies, as indicated in the assumptions. The intention is to provide for a common analytical base between existing and future studies. The troop list used for the scenario has been updated for this study based on the most current MMROP.

1.6.5 Modeling. A systems analysis was conducted based on data collected during this effort to determine the impact of adding AIS traffic to command, control, and intelligence traffic of the LFICS architecture. Figure 1-1 depicts the sequence used for the analysis.

1.7 Report Organization

The remainder of this report is organized into seven sections as described herein:

- Section 2, Scenario and Force Structure. Use of the 1A Scenario and MMROP troop list is explained. Division of the scenario into three phases for Pre-MTACCS and MTACCS eras is discussed.

- Section 3, Fleet Marine Force Systems. This section discusses tactical command and control systems and administrative/logistics systems in general terms. It examines the automation of functions, the evolution of new systems, and briefly describes each MTACCS era system in terms of concept of employment and acquisition schedule. Charts showing OPFACs and AISOPFACs appear in this section.

- Section 4, Information Transfer Requirements. Section 4 ties the OPFACs and AISOPFACs, equipment and scenario together, establishes the information flowlines, discusses internal communications to the systems and points out dependence on the LFICS architecture.

- Section 5, Communications. This section describes the architecture as it exists today and how it will look in the MTACCS era. It describes the equipment in technical and functional terms.

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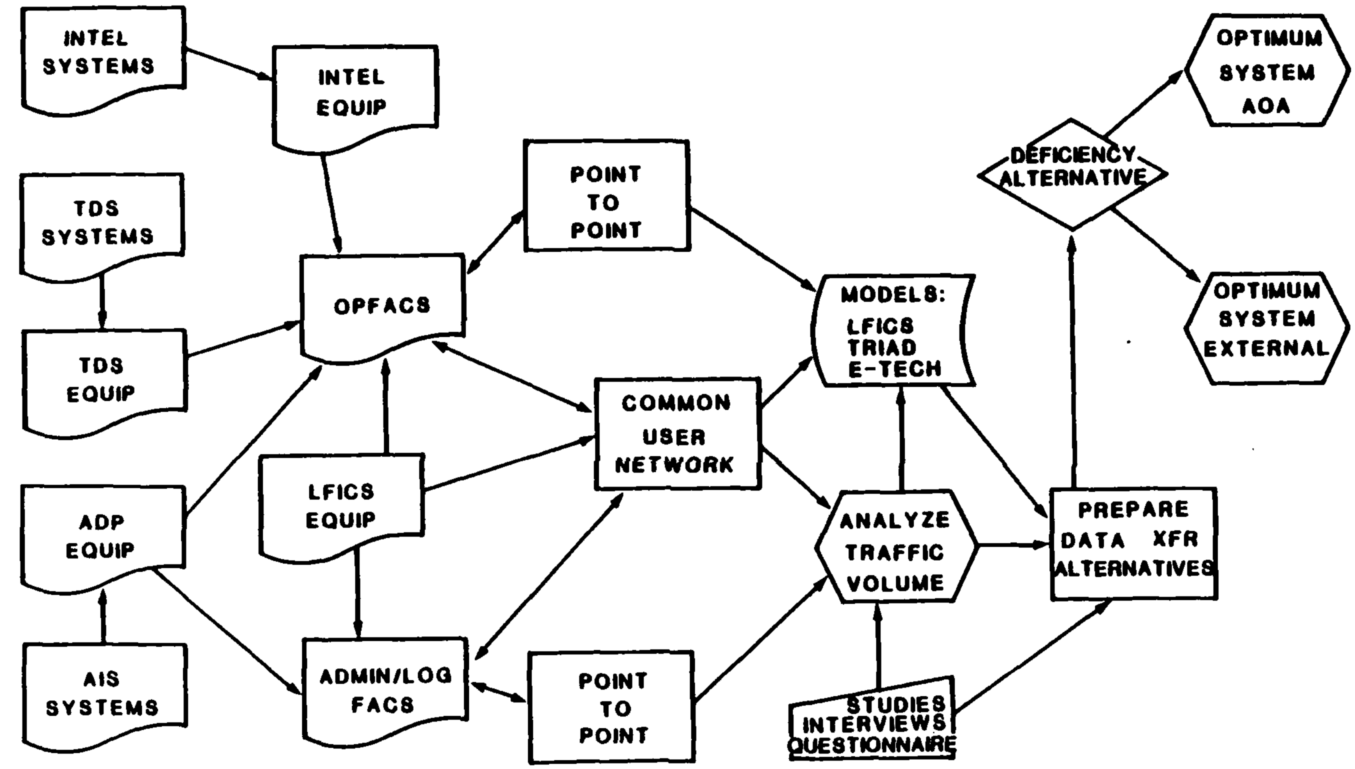

Figure 1-1. Analysis Process

- Section 6, Communications Configurations. Section 6 ties the communication equipment to the scenario in both Pre-MTACCS and MTACCS era. Network diagrams and total equipment breakdown by units are shown.

- Section 7, AIS Communications Requirements. This section examines specific AIS communications requirements, combines them with TDS requirements, and compares them to the communications network described in section 6.

- Section 8, Conclusions and Recommendations. These are drawn from the previous section. An "optimum system" is described and equipment shortfalls are identified.

SECTION 2. SCENARIO AND FORCE STRUCTURE

2.1 General

Communications requirements are best examined while applied to a realistic scenario. Therefore, as required by the Statement of Work, the background scenario used in this study is the MARCOR 1A Scenario, which involves the landing and subsequent operations ashore of a MAF in northern Europe. The realism is somewhat questionable because of the large number of ships involved in the amphibious assault. Further, it does not include some newly formed force structure elements, such as the Light Armored Vehicle Battalion or the Target Acquisition and Control Battery units. Appropriate adjustments were made. The scenario does, however, represent one of the more complex communications situations and was used in related studies.

2.2 Scenario

The scenario, as applied in this study, covers the amphibious assault and land combat ashore phases. The study team, with concurrence from the sponsor officer, agreed to look at the total communications requirements for the MAF both pre-MTACCS and MTACCS. It was also decided to divide the time span of the scenario into three phases. The assault or initial phase covers D-Day through D+4, the second phase is D+5 through D+10 and D+11 onward is used for the third phase. This scenario provides for a prepositioned theater fixed wing element, also called a Theater Airfield Echelon (TAE), which levies a greater than normal burden on the telecommunications assets and capabilities.

2.3 Force Structure

The troop lists of the scenario do not show recently added Marine Corps organizations such as the Light Armored Vehicle (LAV) Battalion or the Target Acquisition and Control Battery of the Artillery Regiment. To ensure that the correct number of troops would be included in the scenario, it was decided to use the most recently published MMROP figures. Some differences existed in that the MMROP organizations do not match the projected combat task organizations of the scenario. For example, the scenario is divided into two elements, e.g., assault element and Theater Airfield Echelon. The MMROP is divided into three elements, the assault element, the assault follow-on element, and a fly-in element. This was compensated for by the three phase approach.

Figures 2-1, 2-2, 2-3 and 2-4 show the organizations participating in the operation as outlined in the 1A scenario and adjusted with the latest MMROP structure. Appendix B depicts the landing schedule for the organizations shown in figures 2-1 through 2-4.

2.4 Phasing Ashore

The three phases of the scenario have been labeled D-Day, D+5, and D+11 so as to coincide with the scenario landing schedule. These are arbitrary points in time which actually represent periods of time, e.g., D-Day may represent a period of several days depending upon the intensity of combat. Likewise D+5 may represent several days and might not occur until the tenth or twentieth day after D-Day. The third phase D+11 also represents a time period of several days and represents the stage where command shifts to the Commander Landing Force (CLF). The purpose is to show possible solutions to communications requirements for both tactical systems and AISs that are scenario independent and related to a particular phase of an amphibious operation.

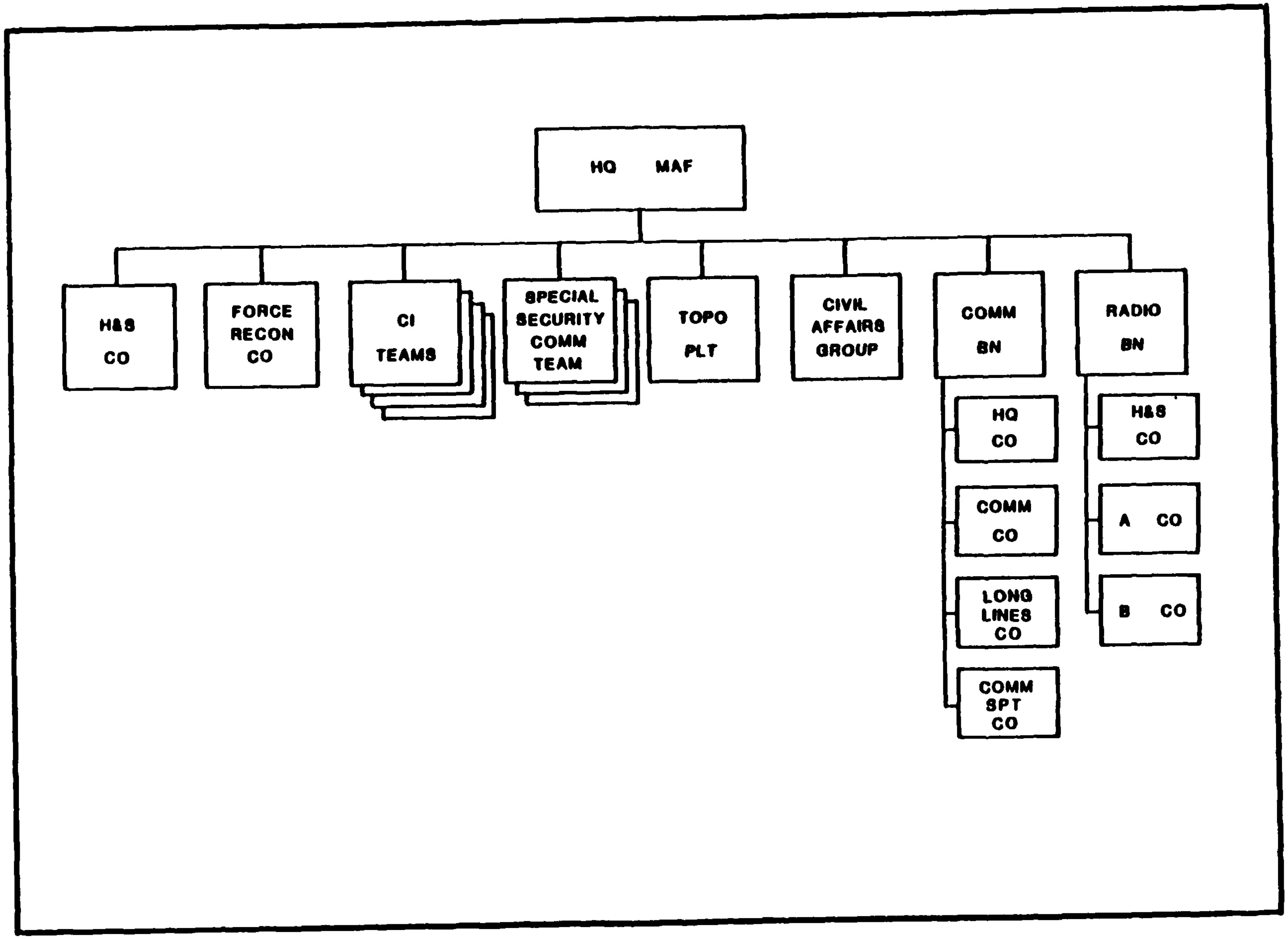

Figure 2-1. MAF Command Organization

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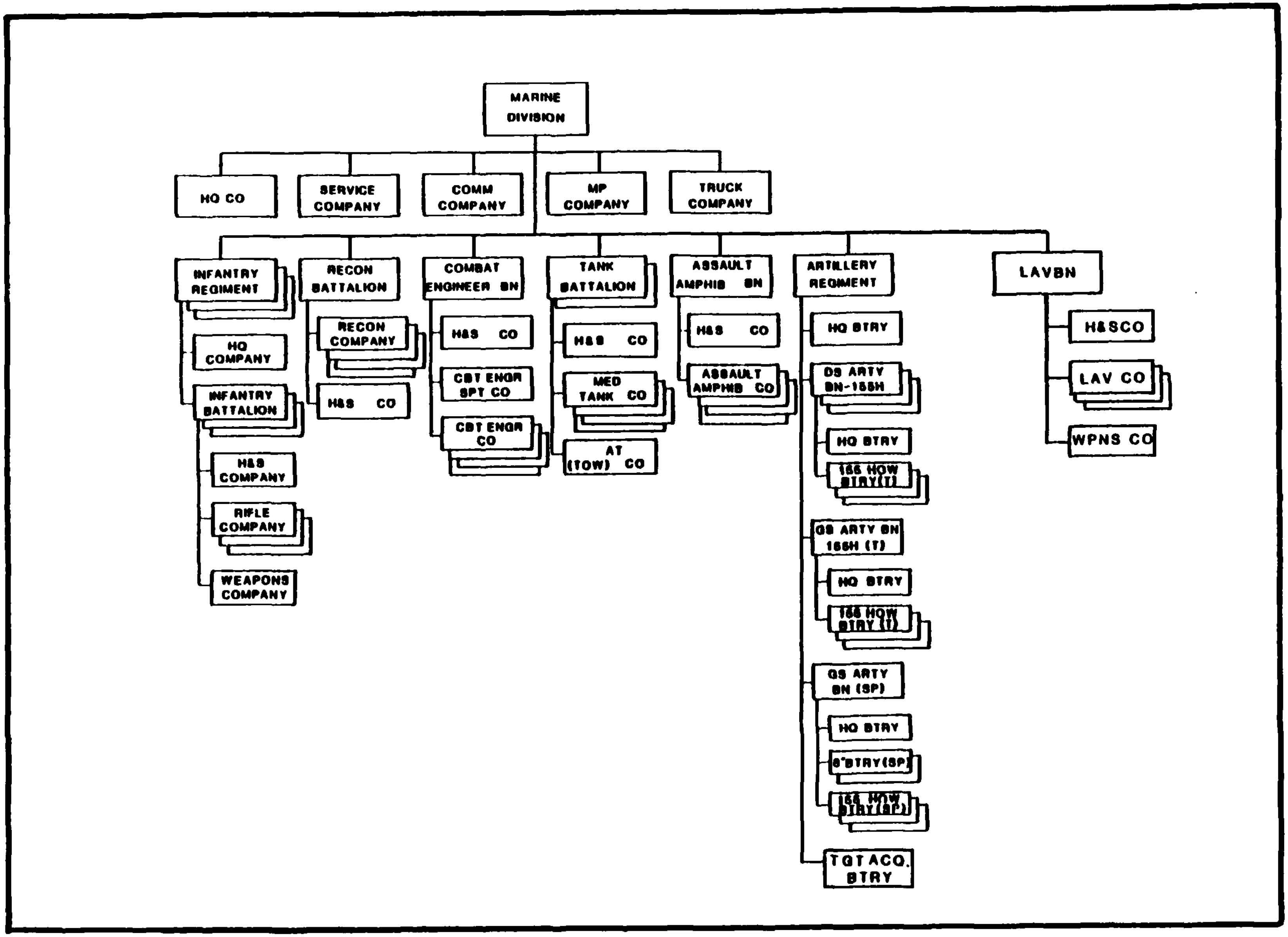

Figure 2-2. Marine Division (Reinforced) Organization

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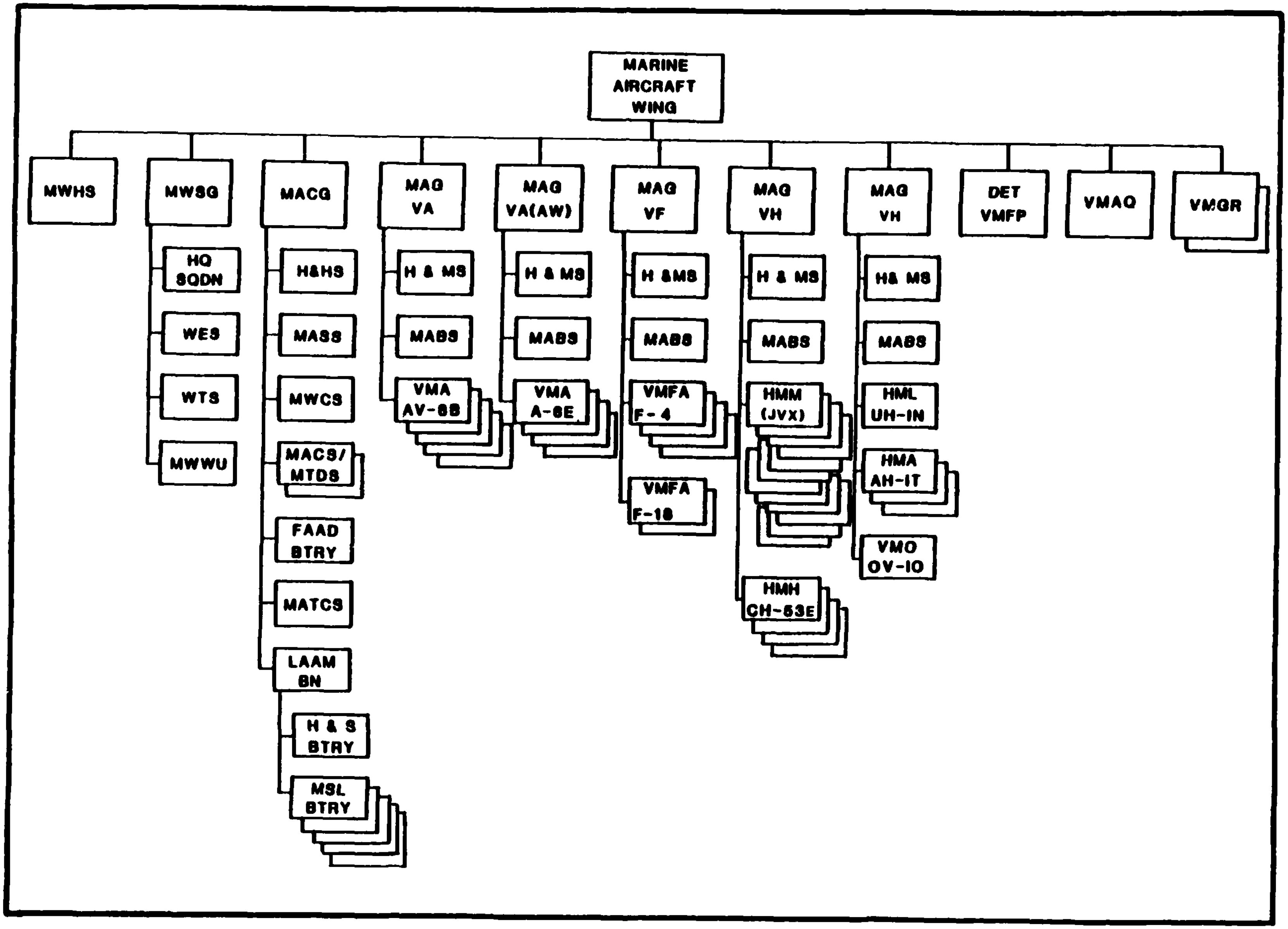

Figure 2-3. Marine Aircraft Wing Organization

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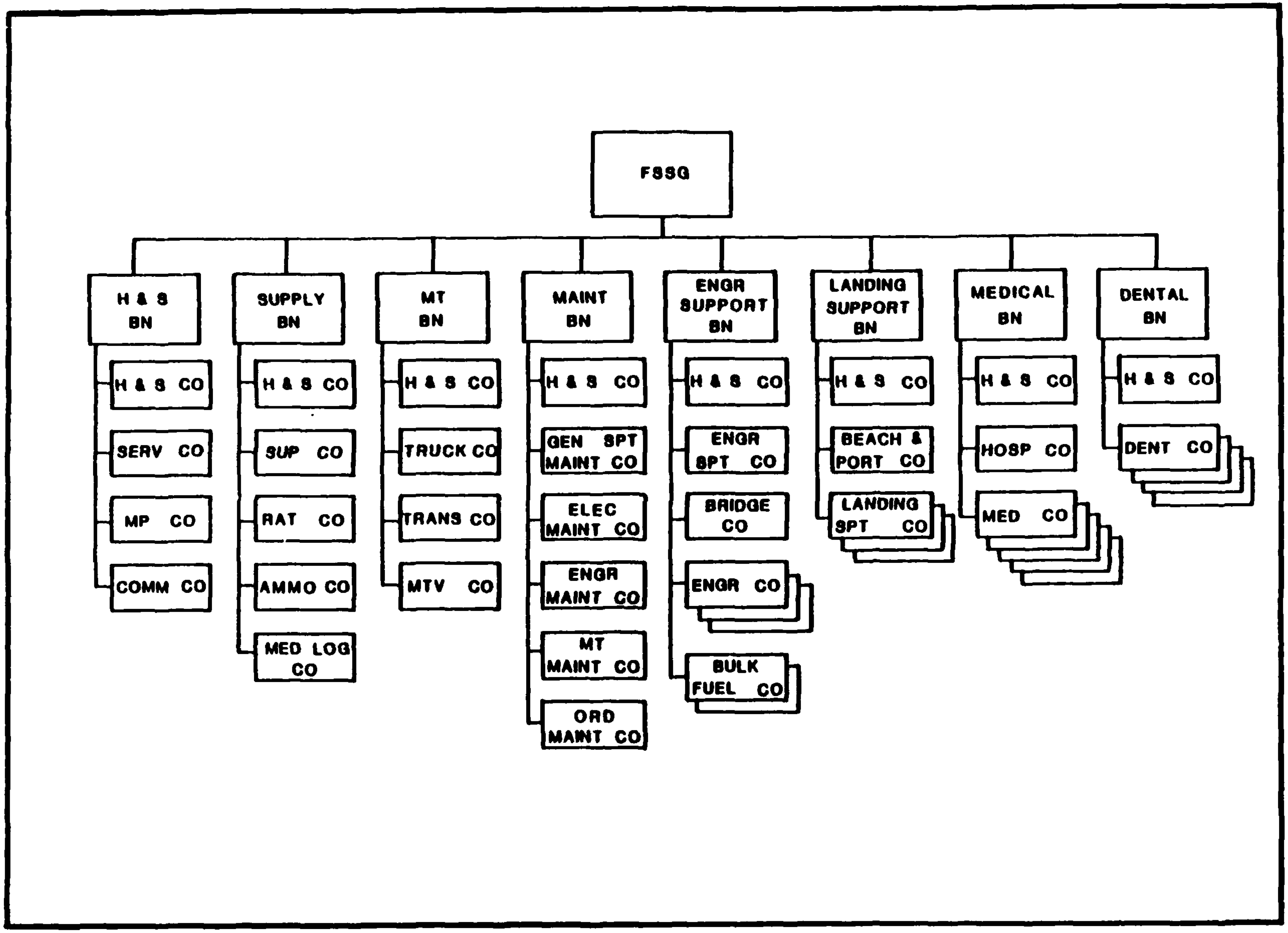

Figure 2-4. Force Service Support Group Organization

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SECTION 3 FLEET MARINE FORCE SYSTEMS

3.1 Introduction

The Marine Corps has actively developed automated TDSs to support the intelligence and operational combat functions since the fielding of MTDS in 1965. The systems under development are the Marine Tactical Command and Control Systems (MTACCS) and are aimed for the 1975-1995 timeframe. These systems will be designed for all of the various sizes of MAGTFs and will support command and control functional areas, such as operations, intelligence, logistics, personnel and administration, fire support, air support and communications. The MTACCS personnel and logistics systems (MIPS and MILOGS) were later determined to be satisfied by the deployable Class I AIS's developed to support the same functions for FMF units in garrison. Therefore, Fleet Marine Forces in combat will use both AISs and TDSs to support operational requirements. This section discusses these systems.

3.2 Automated Information System Architecture

In 1965, the Marine Corps made the commitment to selectively automate its Command and Management Systems. Since that time an extensive collection of resource management systems sponsored and operated by functional managers has evolved. These are all running in a batch-oriented mode on a Marine Corps network of general purpose computers using standard hardware and software under the technical cognizance of C^4 Division, HQMC.

Today, the Marine Corps is firmly committed to conducting its administrative manpower and logistical management functions with Automated

Information Systems (AIS's). All of the major class I AIS's are being redesigned from their current batch-oriented nature to an on-line Data Base Management System (DBMS) orientation. The hardware/software network connecting these systems is being upgraded and extended to the end-user with workstations to accomplish input, edits, validation, retrieval and production functions.

A Class I AIS is a system under the functional control of an Headquarters Marine Corps agency with technical responsibility assigned to either a Marine Corps Central Design and Programming Activity or a contractor. The system is processed on a main frame computer and serves Marine Corps-wide users.

These systems were and are still being designed to be supportive of Marine Corps requirements in all environments, i.e., garrison, deployed and in combat. The original systems have continued to improve as the state-of-the-practice has improved.

For example, the single pay, manpower planning and personnel management system in this environment will be REAL FAMMIS. It is planned to encompass all manpower and financial (pay) management processes using an integrated data base, supporting functional applications during all aspects of a Marine's life in the active, reserve and retired components.

REAL FAMMIS will provide adequate support to all organizational levels of the Marine Corps in all environments: garrison, deployed and in combat. While the current systems were developed to operate under a centralized management, control and processing concept, REAL FAMMIS processing and, in some cases, control will be a combination of centralized and distributed control to efficiently and effectively provide all necessary support. The

system will make maximum use of state-of-the-practice automated data processing, system development methods and techniques to retain system effectiveness for the life of the system. In order to be successful, the REAL FAMMIS program must, during design and implementation, apply intensive engineering and administrative management efforts. This must continue through for the design, development, testing, training, implementation, operation and auditing associated with REAL FAMMIS in a large-scale automated system network, utilizing Data Base Management System (DBMS) and Data Dictionary (DD) technology.

The requirement to update and use information associated with REAL FAMMIS extends to every active, reserve or retired Marine throughout the world. The REAL FAMMIS data base and supporting systems will provide the functional means to:

HQMC

- Structure the Force
- Man the Force
- Determine Training Requirements
- Classify and Assign
- Mobilize
- Administer to Marines
- Administer to Families
- Pay the Force

Field S-1/G-1

- Strength Accounting
- Personnel Administration
- Pay
- Personal Services
- Interior Management
- Law and Order
- Civilian Employees
- Replacements
- Casualties
- Graves Registration
- POWS

To accomplish these goals the REAL FAMMIS Data Base must be useable, available, and accurate (with the degree of accuracy known at all times) in all modes of operation, i.e., garrison, afloat, deployed, combat or training. It must also operate within the system architecture that is supporting the Marine Corps AIS's today and in the future.

Each system identified and sponsored by the Marine Corps has a system architecture which is composed of the following elements:

- Network Architecture
- Hardware Architecture
- Software Architecture
- Data Architecture
- Applications Architecture

These elements of the system architecture have been built upon standards which have been evaluated and published as Marine Corps standards. Each functional system can be described and viewed as a complete separate entity or it can be considered as part of the overall Marine Corps AIS architecture with shared data bases, etc.

The Marine Corps Data Network (MCDN), the backbone communications network architecture, is a dedicated common-user data network which connects the major Marine Corps processing sites. This network will become part of the Defense Data Network (DDN) in late 1986. The processing nodes in MCDN comprise the hardware architecture and include the three CDPAs where the master copies of data bases are kept and supported; the major Regional Automated Service Centers (RASC) which have downloaded copies of the data bases required to support Marine Corps systems and units linked to the RASC; and Remote Job Entry (RJE) sites which communicate to the RASC's. These sites and the DFASC/MASC will function as RASCs and MCDN nodes in the future. Ruggedized computers and terminals are already available to the Supporting Establishment and in all Fleet Marine Force Units at the reporting unit or end user level to provide data entry and local record keeping. End-user computer equipment and software (personal computers with standard packaged software capabilities) will expand the network during the 1987 timeframe.

The software architecture is composed of an extensive array of operating system software which runs under a controlled version of Multiple Virtual System (MVS) in the computer mainframe and provides flexibility in application design and control in the telecommunications environment. This software is continually being upgraded to support the state-of-the-practice automated data processing. The data architecture of the application systems will be constructed using a Marine Corps Standard Data Dictionary and Data Base Management Systems as follows:

- A data base composed of the necessary files, formats and procedures needed to put information into the system, process and extract it. This data base will have the following characteristics:

  - Use of standard data elements, edits, and structures
  - Capabilities for users to add data elements for local use
  - A single agency at HQMC will control additions/deletions/changes to standard data elements, codes, etc.

- Access across organizational lines, horizontally and vertically, will be provided on a need-to-know basis.

3.3 Deployable AIS's

Previous studies have identified various AISs which would deploy or be used in combat. These were reviewed and revalidated through interviews and research. They are shown in table 3-1 with current systems opposite their future counterparts. The changes within these systems are through modernization as discussed in the Introduction of this section. The source data entry requirements for Class I updates and for information exchange requirements to support the MAGTF Commander will not change significantly.

Table 3-1. Deployable Automated Information Systems

CURRENT	FUTURE
SASSY	M3S
MIMMS	M3S
SEMS (CAEMS)	CAEMS
3M	NALCOMIS
SUADPS	SUADPS - RT
FREDS	FREDS
JUMPS/MMS	REAL FAMMIS
UNIT REP	UNIT REP
MAGFARS	SABRS
DOV	DOV
MAGTF LIFT I	MAGTF LIFT II

Table 3-2. Logistics Automated Information Systems

FUNCTION	CURRENT CLASS I	FUTURE CLASS I SYSTEMS
Supply	SASSY	M3S
Maintenance	MIMMS	M3S
Embarkation	SEMS	CAEMS
Transportation	MAGTF LIFT I	MAGF LIFT II

There will, however, be more EUC interchange with the DFASC or MASC from system control units, the Sassy Management Unit (SMU), the Maintenance Management Unit (MMU) and the Administrative Control Unit (ACU), and other units which will be able to install multichannel or switch/terminal capabilities. Brief descriptions of these systems, which will be deployed to support Marine Corps Class I systems data entry, reporting requirements and the MAGTF Commander's resource management requirements, are provided below by functional area.

3.3.1 Logistics Systems

The logistic functions which require a deployable AIS capability are supply, maintenance, embarkation and transportation. These functions, as currently performed in the FMF, are not expected to undergo any significant operational or doctrinal changes over the next fifteen years. However, there will be procedural changes necessitated by the implementation of the Marine Corps Standard Supply System (M3S), CAEMS and MAGTF LIFT II. (See table 3-2.)

The standard Marine Corps sponsored logistics automated systems, currently in use within the FMF, include the Supported Activities Supply System (SASSY), the Marine Corps Integrated Maintenance Management System (MIMMS), the Standard Embarkation Management System (SEMS) and the Marine Air Ground Task Force Lift Model (MAGTF LIFT I). Standard Naval Aviation sponsored systems used by the aviation elements of the Marine Corps are Maintenance Management and Material System (3M), and Shipboard Uniform Automated Data Processing System for Aviation (SUADPS).

3.3.1.1 Marine Corps Integrated Maintenance Management System (MIMMS). MIMMS provides status of equipment undergoing maintenance. This includes repair parts requirements, equipment modification status, and maintenance

actions pending or completed for particular items of equipment. MIMMS consists of a Headquarters Maintenance Subsystem (HMSS) and a Field Maintenance Subsystem (FMSS).

The HMSS provide maintenance management information for Marine Corps Logistics Base, Albany, Georgia, and HQMC systems managers.

The FMSS provides status and supports all ground equipment maintenance performed at the organizational and intermediate maintenance echelons in the Fleet Marine Force, supporting establishment, and selected Marine Corps Reserve units.

Through an automated interface with SASSY, FMSS fields are automatically updated in terms of materials, requisitions, issues, turn-ins and status information. Upon processing, FMSS produces status and equipment readiness reports for all levels of the MAGTF on a daily or periodic basis. On a scheduled basis FMSS also provides selected information to HMSS for management and information purposes (e.g., Equipment Repair Order (ERO) history data, equipment status, readiness data).

MIMMS is user-oriented and designed to work with SASSY and its successor M3S.

3.3.1.2 <u>Supported Activities Supply System (SASSY)</u>. SASSY provides the supply accounting functions, requisitioning capability, requirements determination, and asset visibility for all FMF units except Aviation Supply and Maintenance. The system management control unit of SASSY (the SMU) provides control over all classes of supply in the AOA.

SASSY is processed on ADPE-FMF equipment at the unit level and at the Regional Automated Services Center (RASC). SASSY provides for a local data base, capability for generating local reports, and an interface with the local MIMMS data base. Input to SASSY is currently accomplished by delivery of floppy disks from the user to the RASC or DFASC. Transaction status data is by returned disk.

SASSY interfaces with MIMMS, MAGFARS, and with other authorized sources of supply using standard military transaction formats.

3.3.1.3 Marine Corps Standard Supply System (M3S). The Marine Corps Standard Supply System (M3S) is presently under development as a replacement for SASSY, MIMMS, and other supply AISs. It will be a single system encompassing both the retail and wholesale functions for FMF units and the supporting establishment. M3S will support and consolidate the functions now performed by SASSY, Marine Corps Unified Material Management System (MUMMS), Direct Support Stock Control System (DSSC) and numerous base property control systems. M3S will be implemented in phases as shown in table 3-3 so that the supply functions and operations currently practiced in the FMF undergo little change. The system will be capable of interactive or batch input through interactive terminals or source data automation devices. An M3S goal is to develop a system which operates the same in both deployed and garrison environment, while providing for phased commitment of logistics elements in the objective area.

3.3.1.4 Standard Embarkation Management System (SEMS). SEMS provides a standardized embarkation data system. It permits the establishment and maintenance of embarkation data bases at the battalion, squadron and separate company level. It also provides the capability to manipulate and

Table 3-3. Phase M3S Implementation Schedule

PHASE	ACTIVITY	IMPLEMENTATION COMPLETION DATE
I, II	Data Structure/Refresh	May 84
III	Data Entry (MILSTD I/O)	Aug 85
IV	Replenishment Review	May 86
IV	Stockage Computation	Nov 86
IV	Modeling & Simulation	Jun 86
V	Stratification	Nov 85
V	Provision DBMS Conversion	Nov 85
V	PWR DBMS Conversion	Sep 85
V	MIMMS DBMS Conversion	Jun 84
V	MILSTEP DBMS Conversion	Dec 85
V	SASSY DBMS Conversion	Jun 84
V	DASC DBMS Conversion	Dec 84
VI	Technical Data	Aug 86
VII	Financial Management	Jan 85
VIII	Material Management (Retail & Wholesale)	Oct 86
VIII	Automated Procurement	Mar 87
VIII	Material Returns Program	Nov 85
IX	Transportation Management	Jul 87

consolidate data based on the embarkation task organization and transportation mode. The data bases can be updated readily in garrison, during embarkation, and in a deployed area, for all movement operations. SEMS also produces reports for embarkation management, lift requirements, loading-plan documentation, and selected data/reports as defined by the user.

3.3.1.5 Computer Aided Embarkation Management System (CAEMS). CAEMS is an expansion of SEMS and will provide aircraft loading manifests and graphic ship loading plans. It will use the EUCE.

3.3.1.6 Marine Air Ground Task Force LIFT Requirements and Logistics Planning Factors Model I (MAGTF LIFT I). The MAGTF Lift Model supports the joint planning process and provides task force logistics information in support of ad hoc requirements. The system data base is updated from various manual and automated sources. Updated data base tapes are then passed to users. The MAGTF Lift Model is operational at Headquarters Marine Corps, Headquarters FMF Pacific, Headquarters FMF Atlantic and at selected MAF sites. It is used to support transportation requirements of the MAF. MAGTF Lift output information is input to the Joint Operations Planning System (JOPS).

3.3.1.7 Marine Air Ground Task Force Lift Model II (MAGTF LIFT II). This system and supporting models are being designed to support the information requirements of joint and strategic mobility planners at HQMC and within the operating forces. The system will replace the current MAGTF Lift Model. The proposed system will provide planners with rapid computation of lift data in support of deployment planning using both notional and actual data, provide the capability for force structure analysis and provide

timely access to information on logistics, unit locations, readiness, and personnel. The system will be capable of producing data that is compatible with the World Wide Military Command and Control System (WWMCCS) data formats. This will enable the data to be entered into the Joint Operation Planning System and the Joint Deployment System. The MAGTF Lift II system must be capable of processing and transmitting classified data and will be run on selected Marine Corps work stations connected to the WWMCCS Information Network.

3.3.2 Aviation Logistics Systems. The Aviation Logistics systems are standard Navy sponsored systems built to support Naval Aviation resource management and reporting requirements. Marine Corps Aviation units use these systems and obtain all support for them from the Navy. While aboard Navy ships, Marine units use the Navy Shipboard computers. The Marine Corps owned equipment is located at the flying squadrons and groups. The computers will be hard wired so that there will be no impact on communications internal to the MAG. There is an internal AOA communications requirement to the MAGTF Headquarters and external AOA requirements to Naval commands in CONUS. These Naval Aviation Systems are listed below.

3.3.2.1 Maintenance, Management and Material System (3M). This system collects, stores, and retrieves maintenance and material usage data for aviation activities, which in turn, provide the commander with information concerning past failures, work output, aircraft readiness, and parts requirements.

3.3.2.2 Flight Readiness Evaluation Data System (FREDS). This system collects flight data in order to provide a measurement of aircraft use, aircrew flight activity and training currency, and to provide Individual

Flight Activity Reporting System (IFARS) data to the Navy safety reporting system. FREDS runs on the ADPE-FMF. It is planned for conversion to the Navy equipment.

3.3.2.3 Shipboard Uniform Automated Data Processing System for Aviation (SUADPS). SUADPS automates aviation-unique supply and fiscal management requirements to include inventory control and requisitioning procedures. It is being updated to terminal real-time use.

3.3.2.4 Naval Aviation Logistics Command Management Information System (NALCOMIS). NALCOMIS is designed to replace 3M and to automate the Naval Aviation Maintenance Material Management System in the Navy and Marine Corps for both the regular and reserve forces. Prototype testing began in August 1983 at Marine Corps Air Station, Cherry Point, North Carolina. Initial results point toward significant improvements for both supply and maintenance management efforts. A phased implementation of the NALCOMIS system has begun and will soon reach into each Marine Aircraft Group and Squadron. Honeywell DPS-6 series computers will be provided as the hardware.

3.3.3 Manpower Systems

3.3.3.1 Joint Uniform Military Pay System/Manpower Management System (JUMPS/MMS). The existing pay and manpower management system is JUMPS/MMS. The purpose of JUMPS/MMS is to provide an automated means for the recording, processing, and maintaining of military personnel and pay data on a continuing basis within the Marine Corps. It is an integrated personnel and pay system that has many management functions. These include procurement, distribution, promotion, classification, separation, pay and

allowances, budgets, assignment, and training. JUMPS/MMS maintains a personnel/pay record on regular Marines, plus reservists on active duty for a period of 30 days or longer. JUMPS/MMS may be characterized as a distributed data-processing system with a central facility and master data base, exercising control over remote processing facilities and their data bases. It uses reports of personnel changes, entered into the system by unit diaries or disbursing office transactions to update data.

3.3.3.2 Real-Time Finance and Manpower Management Information System (REAL FAMMIS). REAL FAMMIS is being designed to replace JUMPS/MMS. It will provide the pay and manpower management capabilities for Marine Corps units in garrison and deployed operations. It will integrate information and record-keeping requirements to include information currently maintained in JUMPS/MMS, Reserve Manpower Management and Pay System (REMMPS), retired systems and pay supportive systems. It will also incorporate the Automated Recruit Management System (ARMS), Precise Personnel Assignment System (PREPAS), Retired Personnel Pay System (RPPS), Service Record Book/Officer Qualification Records, personal financial records, Performance Evaluation Data System, individual training records and career planning records. REAL FAMMIS will include conversationally prompted input/extract, summary retrieval, and statistical retrieval of information.

REAL FAMMIS will be implemented in three phases. The first phase is putting the Unit Diary on-line to Kansas City. This has been done for the garrison environment. The second phase is to provide for system integration and finally the third phase is to continue to improve the system through enhanced technology.

3.3.4 Financial Systems

3.3.4.1 Marine Air/Ground Financial and Reporting System (MAGFARS). MAGFARS interfaces with SASSY and is utilized by FMF units to enter, store, and report financial transactions. This system also provides unit commanders with transaction reports, unfilled order information and general ledger reports.

3.3.4.2 Standard Accounting, Budget and Reporting System (SABRS). This system will provide a standard automated financial system for use by all authorized operating budget/allotment holders within the Marine Corps. The system will replace the operations subsystem, PRIME, for the Supporting Establishment and MAGFARS for the FMF. The SABRS data base will be shared with the M3S data base. SABRS will also provide an interactive update and query capability to financial managers at all levels. The SABRS data base will be integrated with that of M3S. An interface with the Navy's Integrated Disbursing and Accounting System (IDA) will be required.

3.3.4.3 Disbursing Officer Voucher System (DOV). The DOV is an accounting system of disbursements and collections that interfaces with the Navy's Integrated Disbursing and Accounts (IDA) System. All FMF and non-FMF disbursing offices provide input on a daily basis. Daily input is aggregated and transmitted on a monthly basis to the Marine Corps Finance Center (MCFC), Kansas City, MO, for limited processing and interfacing with the IDA. Output provided by the DOV System includes listings of expenditures and collections by appropriations and subheads; schedules of disbursements, collections and confirmed deposits, and statements of disbursing officer's accountability.

3.3.5 Operational System

3.3.5.1 Unit Status and Identification Report (UNITREP). Only one AIS is categorized as an "operational" system. UNITREP is utilized to report the combat status of battalions and squadrons through channels to the Joint Chiefs of Staff (JCS). Changes are transmitted through intermediate commands to Division, FSSG, and Wing. The data is then transported or transmitted to the deployable FASC where reports and error messages are generated for review by the MAF. From the MAF, the consolidated data is transmitted via AUTODIN to the FMF, to the CINC, and then to the JCS and CMC. As the information is reviewed at each echelon, reports and error messages are also prepared.

3.4 Tactical Data Systems

The Marine Corps has long been an advocate of automating command and control functions. In the late 1960's a concept for an automated Marine Tactical Command and Control System (MTACCS) was defined. Since that time there have been modifications, changes deletions and additions to the system in an evolutionary process as requirements have been modified and equipment capabilities changed. The most recent Command and Control Master Plan (C2MP) published in March of 1983 listed seven ongoing MTACCS systems in various stages of development:

- Marine Integrated Fire and Air Support System (MIFASS)
- Tactical Combat Operations System (TCO)
- Tactical Air Operations Central 1985 (TAOC-85)*

*TAOC-85 is now called the Tactical Air Operations Module (TAOM).

- o Marine Air-Ground Intelligence System (MAGIS)
- o Position Location Reporting System (PLRS)
- o Marine Integrated Personnel System (MIPS)
- o Tactical Warfare Simulation Evaluation and Analysis System (TWSEAS)

Since 1983, MIPS has been discontinued as a separate MTACCS development. Of the remaining six, five are scheduled to comprise the operational Tactical Data System (TDS) of the Marine Corps. The sixth system, TWSEAS, is planned for employment only during exercises and would not deploy to a combat environment.

Functional descriptions and concepts of employment for all MTACCS systems appear in the C2MP. The Technical Interface Concept (TIC) and the Technical Interface Design Plan (TIDP) contain the operational interface requirements for these systems. Listed below is a brief description of the five MTACCS systems that will operate to support a deployed MAGTF. For a complete description of these systems the C2MP, TIC and TIDP should be reviewed. The TIC also defines the operational facilities where the TDS systems will be employed.

3.4.1 MIFASS. MIFASS is a real-time display/information processing system which is being designed to provide selective automation of command and control functions required for integrated employme of supporting arms available to the MAGTF commander. The MIFASS suite of equipment will be task organized to support functions of the Fire Support Coordination Center (FSCC), Fire Direction Center (FDC) and Direct Air Support Center (DASC). A major component of MIFASS for digital data transfer is the Digital Communications Equipment (DCE) module which will have modem/buffer capability for:

- One-Unit Level Message Switch (ULMS) line
- Ten-wide band, single channel, half duplex radios to provide five full duplex point to point radio links
- One-Tactical Fire Direction system (TACFIRE) inter-center net
- Fifteen-voice/DCT radio nets (VHF, UHF, HF)
- One-local DCT port
- Two-Position Location Reporting System (PLRS) radio ports
- One-point to point TADIL B link to the TAOM

Communications equipment will be provided from the using unit's table of equipment (T/E). Current IOC for MIFASS is FY90.

3.4.2 Tactical Combat Operations (TCO). TCO is being developed to provide an automated, real-time display/information processing system to support staff G3/G2 and S3/S2 functions. The system will be located at Combat Operations Centers (COC) and Tactical Air Command Centers (TACC) and will provide a focal point where a commander can obtain operational information and disseminate command decisions. The equipment suites have yet to be determined for TCO. Recently the Marine Corps has established a test bed using commercial hardware and software to determine specific requirements and functions for planning and execution of operations. The TCO test bed is being designed to support the following functions:

- Message drafting and editing
- User defined message specifications
- User defined display symbol specifications
- Automatic store and forward of message traffic

- Automatic routing, notification, and storage of inter and intra module message traffic
- Automatic prioritization of messages by user defined categories
- Automatic notification and printing of priority messages
- Multiple addressing of messages
- Automatic protocol and transmission medium conversion for specified protocols and links
- Error detection and automatic retransmission
- Net control-maintenance of primary and secondary network topologies
- Automatic duplication of data base information (redundancy)
- Storage of unit status information and messages
- Unit information and message retrieval via query language or pre-defined queries
- Display of maps and situation overlays
- Retrieval of unit information via selection of unit from screen display ("hooking" capability)
- User definable selection of map size, type and number of units to be displayed
- Automatic preparation of automated briefing materials from information as it is received in a user defined format
- Presentation of automated briefing via large screen display or monitor
- Off line local processing and programming capability
- Automatic monitoring and reporting of system status
- System diagnostic routines
- Capability to produce hard copy of messages, reports, other text and graphics

3.4.3 Position Location Reporting System (PLRS). PLRS is an automated tactical data support system organic to the Marine air and ground tactical forces. PLRS equipment generates, transmits, receives and processes signals in order to produce accurate, three-dimensional, real time position location and identification information for selected PLRS-equipped air and ground elements and vehicles. Stored information is updated and displayed at specified landing force command and control agencies for fire support planning, command and control functions, and coordination purposes. PLRS will also operate as an accurate and reliable navigation aid for air and ground users by providing, on demand, user position, identification, navigation and conflict avoidance information. Communications between user units and between user units and the master station are inherent to the system. PLRS will provide Position Location Information to MIFASS via the PDP-11/34 Microprocessor which will be colocated with the master station. The PDP-11 will convert PLRS information to MIFASS format at 16KB/s which will be transmitted via point to point T/E SINCGARS radio or via landline. Prior to fielding MIFASS a user unit will be placed in the Combat Operations Center (COC) to provide PLRS information. The test bed TCO is developing plans to connect a user unit to a GRID computer to provide a display capability to the COC.

3.4.4 Tactical Air Operations Module (TAOM). The TAOM, formerly known as TAOC-85, is being designed to perform real-time air control functions presently performed by the Tactical Air Command Center (TACC) and the Tactical Air Operations Center (TAOC). The TAOM can be employed in configuration of one to five modules to provide the Tactical Air Commander (TAC) with full functional capability during all phases of an amphibious operation. One module establishes a TAOC and additional modules increase the number of sensor interfaces, operator positions, computer capacity and

air-to-air ground controlled interceptions. The TAOM shall be capable of interfacing with MIFASS, the TCO in the TACC and other external air control agencies. Communications shall be by combinations of voice and data using wire, radio, Unit Level Message Switch (ULMS) and the Unit Level Circuit Switch (ULCS). The radio equipment will be components of the system. The ULMS and ULCS plus direct wire lines will be provided by the using unit.

3.4.5 Marine Air Ground Intelligence System (MAGIS). MAGIS is being designed to provide a semi-automated, tactical intelligence system for the MAGTF commander to enabled his intelligence staff to process large quantities of information into timely and accurate intelligence. MAGIS will be fielded as four constituent but independently deployable segments:

- Image Processing (IP) - processes imagery into usable form for interpretation. The IP will be a product improvement of the existing ES-40 IP segement.

- Imagery Interpretation Segment (II) - The II will provide a computer assisted capability to exploit multisensor imagery and produce formatted interpretation reports, plots and other products.

- Tactical Electronic Reconnaissance Processing and Evaluation System (TERPES) - The TERPES will perform functions necessary for conducting EA-6A/B electronic warfare flight processing, evaluation and reporting functions to include mission planning, briefing and debriefing.

- Intelligence Analysis Center (IAC) - The IAC will process information from the II, TERPES and other intelligence sources into usable intelligence for the MAGTF commander. It will consist of an automatic data processing/communications shelter and one, two or three analysts shelters. Current plans are for the IAC to be assigned to each MAF and to selected Marine Amphibious Brigades. It may be deployed in MAF size operations below the MAF level depending on requirements. The IAC will interface with TCO through TCO channels or special intelligence channels. TCO will be a conduit through which intelligence flows from the IAC to subordinate echelons and through which combat information flows from subordinate, non-IAC equipped units to the IAC.

SECTION 4. INFORMATION TRANSFER REQUIREMENTS

4.1 Introduction

Section 3 included discussion of the Automated Information Systems (AISs) that have been identified as required to satisfy the garrison, peacetime management of the Marine Corps. These were designed to provide support at all levels of command, i.e., from the battalion, squadron through the Fleet Marine Force Commander to Headquarters, Marine Corps and the Joint Chiefs of Staff. Section 3 also described the Tactical Data Systems. This section defines Automated Information Systems Operational Facilities (AISOPFACs) that utilize AIS systems in a wartime environment to support management functions, and describes tactical Operational Facilities (OPFACs) that are supported by TDSs. Multiple Agency Sequence Diagrams appear in this section for AISOPFACs. These diagrams display the flow of information between AISOPFACs and identifies information exchanges between AISOPFACS and OPFACs. This section also defines the AIS operational facilities, which, by using the data bases developed to support these class I systems garrison management functions, can support operational requirements for units deployed or in combat.

All previous studies have shown that several AISs would be necessary in combat, but they have stopped at that point. No concept or description of how they would be utilized in combat has been developed. Identified systems primarily perform resource management functions. They include all of the Marine Corps Class I AISs and, in the case of Marine Corps aviation units, they also include the standard Naval aviation systems for supply and maintenance.

The Marine Corps AISs have been and are being redeveloped using the standard system architecture as described in section 3. The network architecture described in section three is being expanded to include communications requirement or between the deploying MAGTF and the MCDN node used by the MAGTF in garrison. The deployed units continue to perform data entry to the Marine Corps AISs and maintain their own data bases for local use.

The primary difference between the garrison environment and combat is the time critical information requirements of the MAGTF Commander. Because of the high combat intensity and MAGTF size in the 1A Scenario, the MAF Commander would require the DFASC operating as a RASC with access to the manpower and logistics data bases to support his logistics and manpower planning and execution. This requirement of the DFASC to operate as a RASC was derived by the study team from analysis of doctrine and interviews with personnel in the field. These data bases would be downloaded from the RASC and constitute the Master Data Bases for the MAGTF. Changes to these data bases would be by ADPE-FMF entry from units having them to the deployed system control unit (SMU, MMU, ACU). This would provide the MAF Commander and his subordinate commanders with the information they need to plan and execute operations and also provide updated information to the CONUS master data bases for external support and management use.

The Naval aviation supported systems would use standard Navy ADPE provided to the aviation units at MAG and Squadron level. The equipment used will be the Honeywell-DPS 6 which will be hard wired within the MAG, thereby not requiring any special communication equipment. However, the extended communications support of these Aviation Class I Systems external of the AOA is the same as the Marine Corps AIS's but with different destinations. These standard Navy aviation logistic systems can also support the operational planning requirements of the MAGTF commanders.

All of the Marine Corps and Naval Aviation AIS's are evolving systems. They have existed in various degrees of automation for several years. They are all being upgraded with new procedures, hardware and software but the operational requirements they have to satisfy both operationally in the FMF and at higher headquarters are essentially the same. The evolving changes are mainly caused by changes in the state-of-the-practice in ADP hardware and software. At the same time, these systems are being reviewed to accomplish a single automated data processing support concept which will:

a. Reduce distinctions between FMF and supporting establishment automated information systems (AISs).

b. Make FMF and supporting establishment AISs subsets of Marine Corps-wide AISs.

c. Reduce distinctions between AISs and TDSs.

d. Identify TDS equipment interoperable with Marine Corps AISs to satisfy the information requirements of higher headquarters.

4.2 AISOPFACS

The U.S. Marine Corps Technical Interface Concepts (TIC) document describes baseline C3 tactical operational facilities (OPFACs), their functions and interface requirements. An OPFAC is defined, therein, as an organizational element specifically tasked to perform designated tactical functions. The term is used regardless of the size of the facility so long as it is essential in performing tactical functions. For purposes of this study, OPFACs are organizational elements in facilities, performing activities to support functions.

Given its tactical orientation, the OPFACs identified in the TIC deal with the operations and intelligence functional activities involved in planning, directing, coordinating, and/or control of tactical operations. Accordingly, the focus is on Tactical Data System (TDS) support of G-3/S-3 and G-2/S-2 activities as defined in FMFM 3-1, "Command and Staff Action", and in supporting tactical/fire support FMFMs for specialized areas of warfare.

MAGTF information processing and communication requirements, however, include many things in addition to the TDS applications. These additional applications, referred to as Automated Information Systems (AIS) include all of the administration/manpower, logistic and financial functional activities which are also essential to the continuing effectiveness of a deployed MAGTF. These activities are also conducted in operational facilities of varying size distributed throughout the AOA. AISs are defined in the TIC as:

> "Formerly management information system (MIS). A collection of functional user and automated data processing people, procedures, and equipment, including automated data processing equipment (ADPE) designed, built, operated, and maintained to collect, record, process, store, retrieve, and display information essential to a commander in executing the command and management functions of planning, directing, and controlling the use of resources to accomplish missions assigned. (For purposes of this document AIS are automated and exclude tactical command and control (TC2) systems.)"

Taken in the generalized context, OPFACs of any type deal with six activities to assist in the command and control of MAGTF resources. They are:

- o Planning
- o Evaluating
- o Forecasting
- o Programming
- o Monitoring/Inventorying
- o Supervising/Controlling

These activities are executed to varying degrees in the following standard functional areas:

- o Operations
- o Administration/Manpower
- o Finance
- o Intelligence
- o Logistics

During the conduct of the first phases of the MAGTF Data Transfer Alternatives Study, it became apparent that the Administration/Manpower, Logistics and Finance activities performed by AISs in the MAGTF parallel those of the TDS. It was further evident that the AISs should be defined and evaluated in the same terms as the TDSs so the total requirement could be aggregated and analyzed in terms of their combined data transfer requirements.

The purpose of this part of section 4 is to present an initial methodology of defining AIS operations and facilities or, "AISOPFACs", in a MAGTF in the same manner as Tactical Data Systems. This is necessary in order to provide a common basis for definition and evaluation of systems which will co-exist in the AOA and use common telecommunications systems.

AISOPFACs exist in the form of administration/manpower, logistics and financial operational facilities necessary for accomplishment of the MAGTF

mission. Administrative/Manpower, Logistics, and Finance (G-1/S-1; G-4/S-4; Comptroller/Disbursing) functions and their respective OPFACs are summarized in this document. In addition, a fourth category of AISOPFAC, the Automated Data Processing (ADP) OPFAC is discussed. This will be either the prototype Deployable Force Automated Service Center (DFASC) or its follow-on, the Mobile Automated Service Center (MASC). Both are general purpose computer support facilities which serve the MAGTF commander by providing on-site AOA data processing support.

For the three areas of administration/manpower, logistics, and finance, the six management activities are translated into functional requirements or tasks that have to be accomplished within each area. This grouping into identifiable OPFACs will support a more detailed examination of their respective tasks and allow for identification of data flow between all OPFACs, for both Automated Information Systems and Tactical Data Systems. The following paragraphs list AISOPFACs with a description of tasks performed. How they will interface and exchange information with other AISs and with TDSs is shown in this section by Multiple Agency Sequence Diagrams. The remainder of this section discusses the AISOPFACs.

4.2.1 G-1/S-1 Staff Sections. The G-1/S-1 Staff sections are those AIS OPFACs that provide administration/manpower support to the commander. The six generalized management activities in the G-1/S-1 AISOPFACs are applied to the administrative/manpower area of responsibility in order to provide assistance in command and control. The specific responsibilities pertaining to the G-1/S-1 AISOPFACs in the areas of personnel management and administration are:

a. Data Transfer
b. Personnel strength control

c. Replacement control and management

d. Legal matters

e. POW administration

f. Casualty reporting and burial arrangements

g. Morale and welfare

h. Personnel assignment, promotion, classification

i. Civilian personnel

j. Interior management e.g. housekeeping, base administration

k. Postal services

l. Religious needs

m. Documentation preparation

4.2.2 Administrative Control Unit (ACU). The ACU is the AISOPFAC that provides manpower information, collection and reporting support to the commander. The ACU will be located in the immediate vicinity of the DFASC or MASC for close coordination and ease of data transfer. The location of the ACU is driven by the location of the DFASC at the FSSG headquarters. This conforms to the location of the ACU at the force logistics activities during previous conflicts and deployments. The major responsibilities carried out in the ACU are:

a. Receive, validate, complete, and transmit unit diaries

b. Maintain, in conjunction with the DFASC, the MAGTF manpower data base

c. Act as focal point for casualty reporting

d. Perform replacement reporting and assignment tasks

e. Provide manpower information to MAGTF and subordinate unit commanders

4.2.3 G-4/S-4 Logistics Staff Sections. The G-4/S-4 Staff Sections are those LOG AISOPFACs that provide logistics support to the commander. The six generalized management activities in the G-4/S-4 AISOPFACs are applied

to the logistics support area of responsibility in order to provide assistance in command and control. The specific responsibilities pertaining to the G-4/S-4 AISOPFACs in the area of logistics support are:

a. Provide logistics support involving:
   - Supply
   - Maintenance
   - Transportation
   - Medical
   - Dental
   - Engineer
   - Landing (Shore party)
   - Material handling
   - Food service
   - Embarkation

b. Manage and account for property

c. Control traffic in AOA

d. Control and manage civilian labor for combat service support

e. Provide graves registration

f. Perform reclamation and salvage operations

g. Package, prepare and preserve materials

h. Enforce safety programs

i. Prepare documentation

j. Provide for and control of ADP support

4.2.4 SASSY Management Unit (SMU). The SMU is the AISOPFAC that provides assistance in management of assets and requirements for all classes of supply in support of the MAGTF commander. The major specific tasks performed by the SMU AISOPFA^ are as follows:

a. Review and maintain inventory of assets and requirements for all classes of supply
b. Maintain applicable records
c. Inventory stocks
d. Control data processing requirements
e. Screen, approve, and enter supply transactions
f. Prepare output transactions and reports for using units
g. Data transfer
h. Update data base
i. Perform source data entry
j. Determine trends and provide status
k. Exchange data with MMU

4.2.5 MIMMS Management Unit (MMU). The MMU is the LOG AISOPFAC that provides maintenance management assistance to the MAGTF commander. The major specific tasks performed by the MMU are as follows:

a. Record, store, and process maintenance data
b. Perform source data entry
c. Receive data from SASSY
d. Monitor trends and equipment status
e. Receive input data from using units
f. Data transfer
g. Prepare output reports
h. Maintain data base

4.2.6 Aviation Supply (AVN SUP). The AVN SUP AISOPFAC provides aviation supply support to the Aviation Element commanders. There are AVN SUP AISOPFACs at Squadron, Group, and Wing levels, exchanging data via the

Supply Automated Data Processing System (SUADPS/NALCOMIS) hardware computer system. The major specific tasks performed by the AVN SUP AISOPFAC are as follows:

a. Maintain data base
b. Receive and process supply requisitions
c. Review, validate, and determine availability of parts
d. Prepare issue authorization
e. Order/re-order parts
f. Provide data output/reports
g. Perform data entry
h. Determine trends
i. Data Transfer

4.2.7 Aviation Maintenance (AVN MAINT). The AVN MAINT AISOPFAC provides aviation maintenance support to the Aviation Element commanders. The AVN MAINT AISOPFAC nodes are located at *Squadron*, *Group*, and *Wing* levels and perform the following specific tasks:

a. Maintain data base
b. Receive and process data
c. Perform data entry
d. Prepare reports and monitor trends
e. Data Transfer

4.2.8 Tactical Logistics Operations Center (TLOC). The TLOC AISOPFAC, located at FSSG or senior Combat Service Support Unit headquarters, is the AISOPFAC that provides command and control of all logistic support activities in support of the MAGTF commander. The combat service support activities and tasks controlled at the TLOC AISOPFAC are as follows:

a. Logistics Support

Supply

Maintenance

Embarkation

Medical

Dental

Transportation

Engineering

Material handling

b. Graves registration

c. Food Service

d. Reclamation and salvage

e. Property acounting

f. Documentation

g. Safety

h. Packaging, preparation and preservation

i. Base operations/support

j. Traffic control/military police

k. Preparation of reports

l. Transmission of data

m. Data base maintenance

n. PX services

o. Container accounting

p. MPS marriage procedures

q. Special Services

r. Civilian personnel management for CSS support

4.2.9 Supply Control Activity (SCA). The SCA AISOPFAC, located at the FSSG, is the AISOPFAC that provides supply support to the MAGTF commander. The SCA is a deployable AISOPFAC, an element of the SMU which performs the tasks of the SMU when the whole SMU is not deployed or is spread over an extended area of operations. SCA responsibilites are:

a. Review and maintain inventory of assets and requirements for all classes of supply
b. Maintain applicable records
c. Inventory stocks
d. Control data processing requirements
e. Screen, approve, and enter supply transactions
f. Prepare output transactions and reports for using units
g. Data transfer
h. Update data base
i. Perform source data entry
j. Determine trends and provide status
k. Exchange data with MMU

4.2.10 Disbursing/JUMPS. The DISBURSING/JUMPS AISOPFAC provides pay related management support to the MAGTF commander. There are also DISBURSING/JUMPS AISOPFACs at Division, Wing, and FSSG headquarters level. The major special tasks performed at this AISOPFAC include:

a. Preparation of allotment forms
b. Preparation of payroll
c. Maintenance of records
d. Maintain Records
e. Prepare/process vouchers and claims

f. Receive/process incoming data

g. Perform data entry

h. Maintain/update data bases

i. Perform audits

j. Perform accounting functions

k. Arrange for special pay

l. Data Transfer

4.2.11 S-4 Finance Staff Section. The S-4 FINANCE AISOPFAC provides support to the commander at Regiment/Group level and below. The special tasks performed at the S-4 FINANCE AISOPFAC are:

a. Budget preparation

b. Accounting

c. Reports preparation

d. Data transfer to MIMMS and SASSY

4.2.12 Comptroller. The COMPTROLLER AISOPFAC provides support to the MAGTF commander in the area of finance and budgeting. Division, Wing, and FSSG also are supported by COMPTROLLER AISOPFACs. The special tasks performed at the COMPTROLLER AISOPFACs are:

a. Preparation of budget

b. Allocation of funds

c. Accounting

d. Auditing

e. Reporting

f. Establishment of a Disbursing Office

g. Data transfer to CFAO

4.2.13 Consolidated Finance and Accounting Office (CFAO). The CFAO AISOPFAC supports the MAGTF commander in the area of financial management. The special tasks performed at the CFAO Finance AISOPFAC are:

a. Maintain SABRS and MAGFARS data bases
b. Receive and process information from Comptrollers, G-4/S-4 Finance sections and disbursing AISOPFACs
c. Perform accounting procedures
d. Reconcile accounts
e. Prepare reports
f. Data transfer

4.2.14 Deployable Force Automated Service Center (DFASC). *The DFASC AISOPFAC provides automated data processing support to the MAGTF commander. The special tasks performed at the DFASC are as follows:

a. Provide ADP support to the MAGTF
b. Download files from RASC
c. Maintain MAGTF Class I and II AIS data bases
d. Aggregate Class I and II system changes
e. Prepare Class I and II data for transmission to CONUS from AOA
f. Prepare reports
g. Data transfer within AOA
h. Support CSS interactive ADP functions

*The three DFASCs are prototype MASCs. Subject to the successful completion of prototype tests, three MASCs per MAF will be procured.

4.2.15 MAGTF Automated Service Center (MASC). The MASC AISOPFAC provides automated data processing support to the MAGTF commander. There will also be MASC AISOPFAC support provided at Division, Wing, and FSSG Headquarters level. The special tasks performed at the MASC AISOPFAC are as follows:

a. Provide ADP support
b. Download files from RASC
c. Maintain required data bases
d. Aggregate Class I and II system changes
e. Prepare Class I and II data for transmission to CONUS from AOA
f. Prepare reports
g. Data transfer within AOA

Figures 4-1 through 4-4 show the MAGTF organizations, their respective AISOPFACs, and their relative locations based upon the scenario described in section 2. Figures 4-2 through 4-4 also show the proposed locations of the MASCs in dotted circles.

4.3 TDS OPFACS

As described in the Technical Interface Concepts document (reference vv), an OPFAC is an organizational element that assists and supports the commander in the exercise of his command by planning, directing, coordinating, and/or controlling tactical operations.

There are twenty eight OPFACs identified in the TIC as Marine Corps agencies. All perform unique functions in the execution of a tactical operation. The TIC defines each of the OPFACs and the TIDP, through the use of Multiple Agency Sequence Diagrams (MASDs), delineates their

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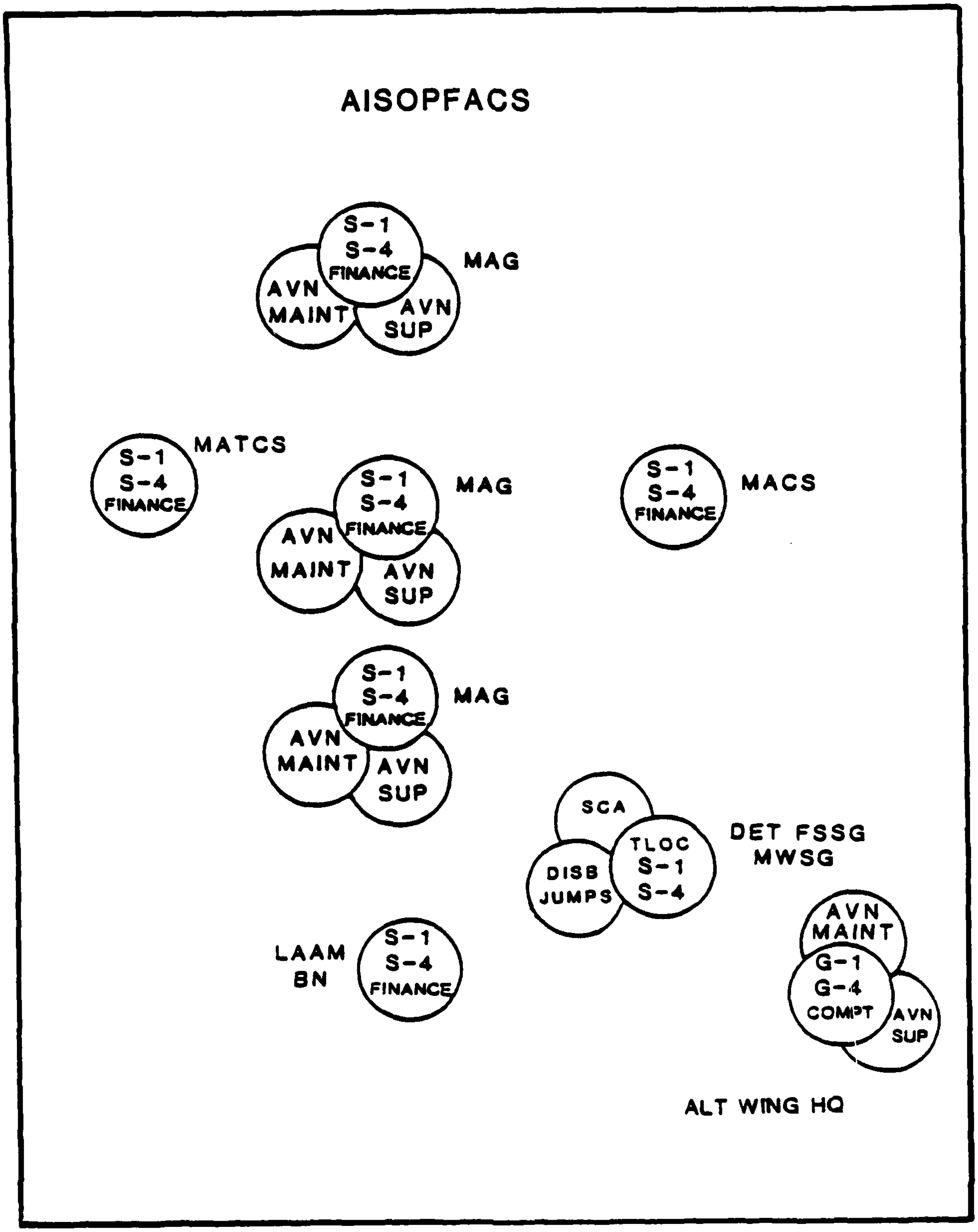

Figure 4-1. AISOPFACS D-Day to D-11 (TAE)

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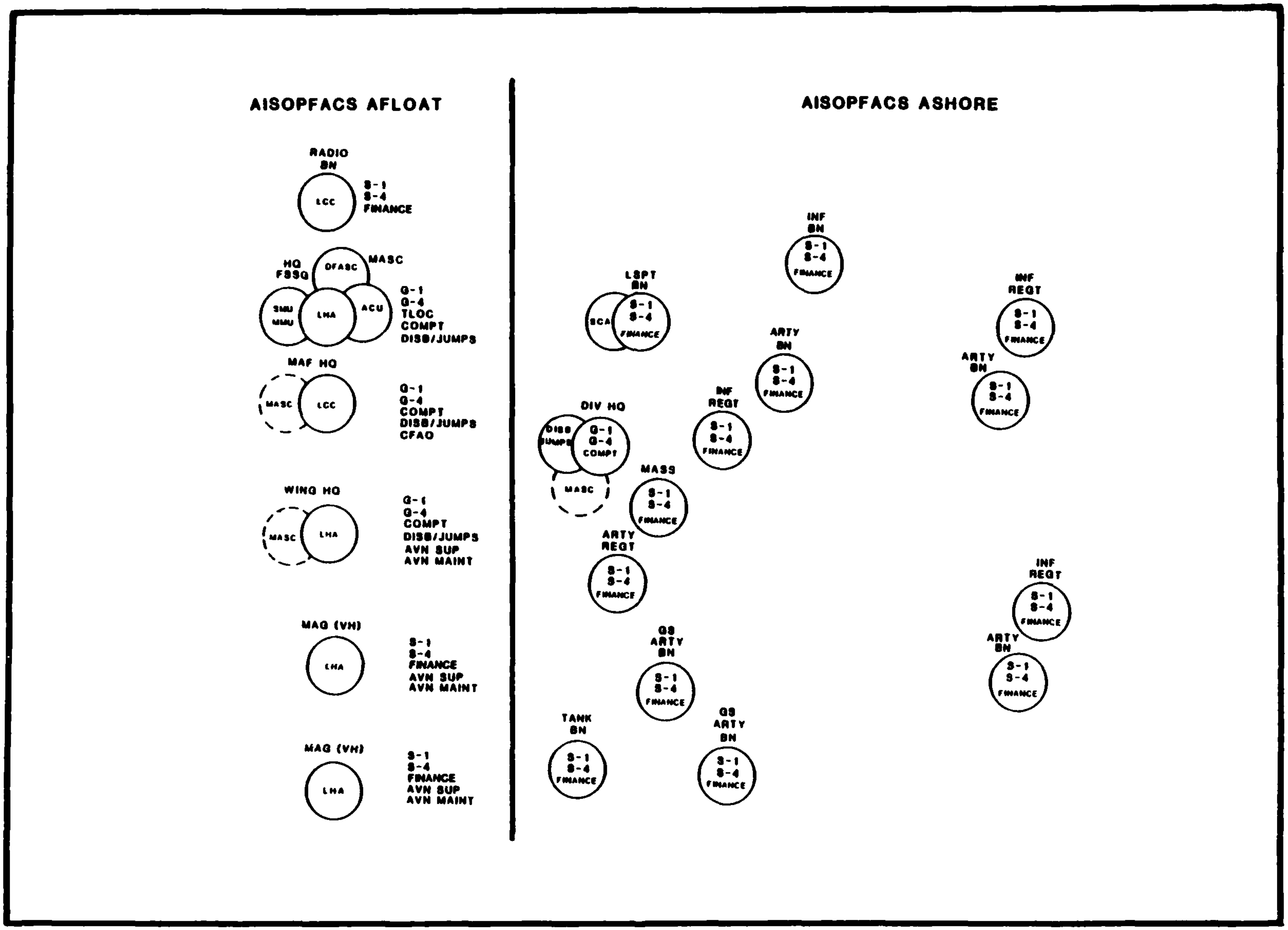

Figure 4-2. AISOPFACS D-Day (AOA)

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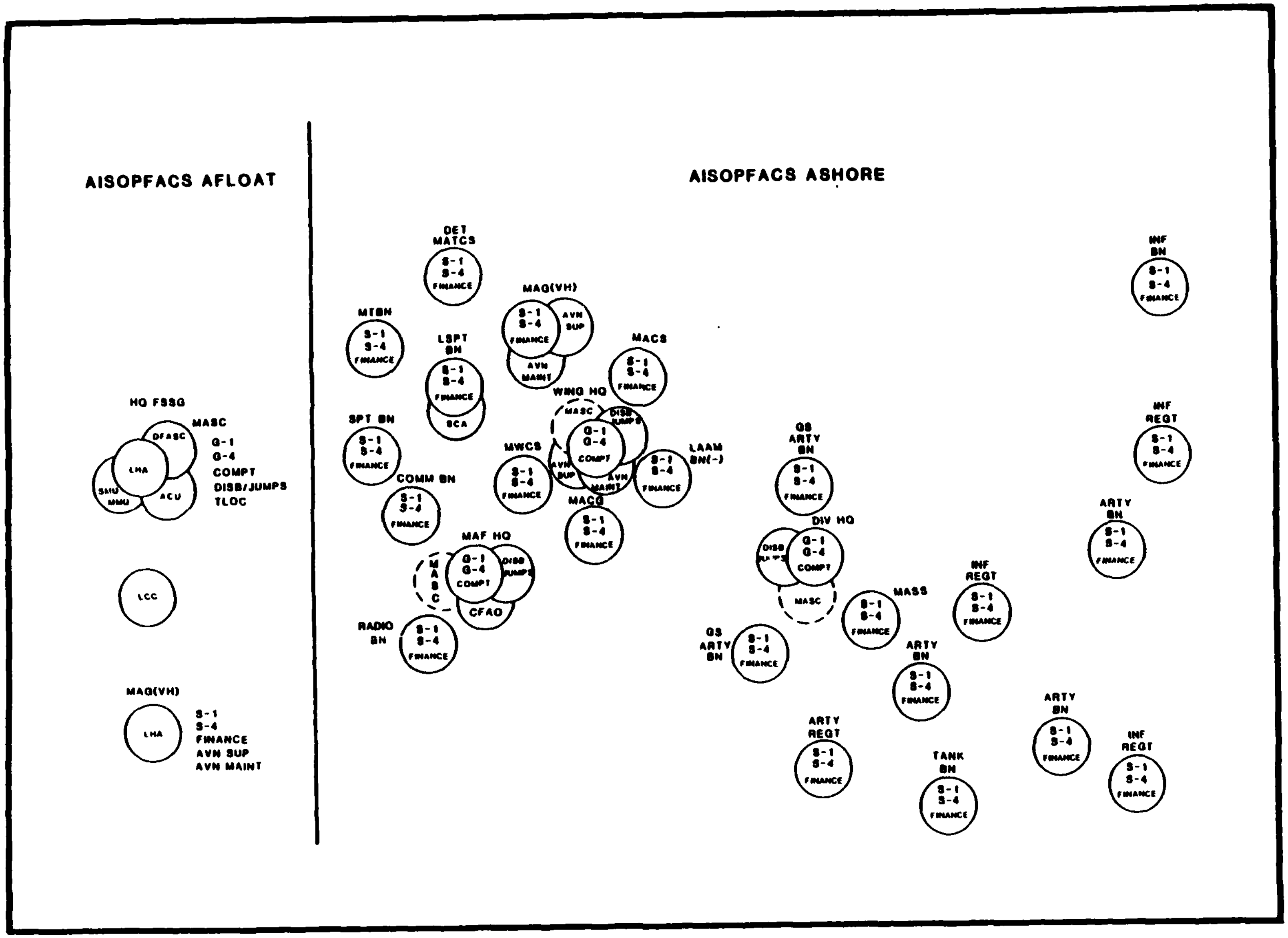

Figure 4-3. AISOPFACS D+5 (AOA)

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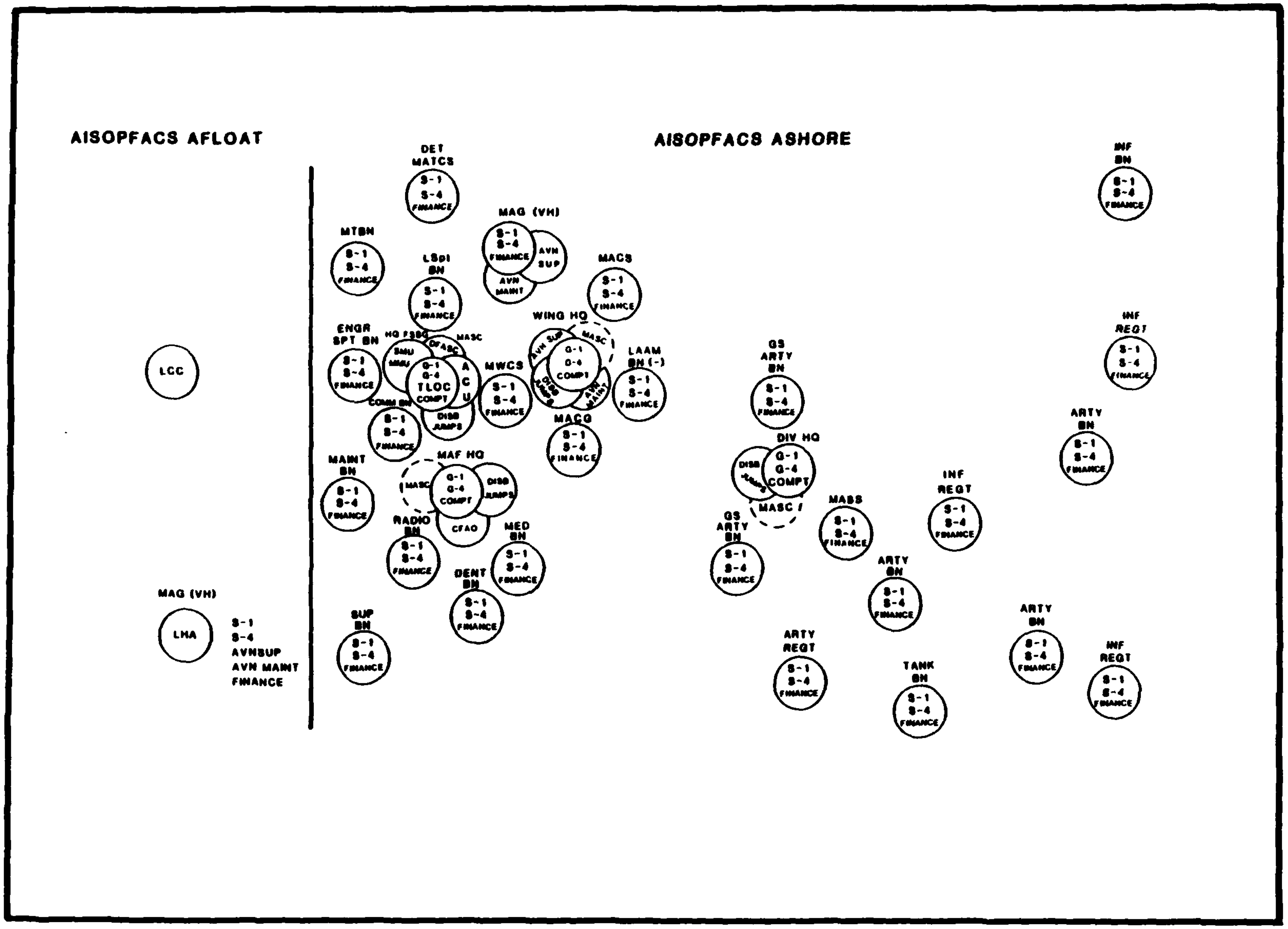

Figure 4-4. AISOPFACES D+11 (AOA)

functions and interrelationships. The Tactical Data Systems defined in section three will automate certain functions of these OPFACs. Table 4-1 lists the OPFACs and the TDSs which will support them.

Operational Facilities exchange information in the AOA, and between the AOA and the TAE, over both the single channel and multichannel radio systems, and by direct landline where practical. In today's environment the exchange of information is by voice and message traffic over analog circuits. The introduction of the Digital Communications Terminal (DCT) at all echelons will permit rapid digital exchange using pre-formatted messages. The use of end user computers in some commands today is a prelude to the introduction of TDSs. It provides the commander with an automated tool to perform various OPFAC functions and to exchange information related to the various functions more rapidly between OPFACs.

The Combat Operations Center (COC) is the primary control agency employed by ground and aviation combat, combat support and combat service support organizations. It is staffed by G2/G3 personnel as well as selective members of the G1/G4 staff together with designated communications personnel. It is the hub of the command for planning and execution of combat operations. As such all supporting information flows in and out of this OPFAC. It is at this OPFAC that AISOPFAC information exchange with tactical OPFACs should logically occur.

During an amphibious operation, until such time as command shifts from the CATF to the CLF, Navy OPFACs located aboard amphibious ships will be the controlling agencies for the operation. As Marine OPFACs are established ashore communications circuits will be established with their Navy OPFAC

Table 4-1. OPFAC/TDS Relationship

OPERATIONAL FACILITY	TACTICAL DATA SYSTEM
COC-MAGTF	TCO, IAC
COC-GE	TCO
FSCC	MIFASS
FDC	MIFASS
TACC	TCO, TAOM
TAOC	TAOM
II	II
MC INTEL	II, IP
TERPES	TERPES
DASC	MIFASS

Table 4-2 Marine/Navy OPFACs

MARINE OPFACS	NAVY OPFACS
COC-MAGTF	FLAG COMMAND
COC-GE	FLAG COMMAND
FSCC	SACC
FDC	CIC/FSG-N
TADC	TACC (N)
TAOC	CIC/SCG-N
II	JIC-N
MC INTEL	JIC-N
TERPES	JIC-N
DASC	HDC (N)/TACC (N)

counterparts. These circuits will remain active until such time as the Marine OPFAC is fully operational ashore, command has shifted and CATF no longer remains in the vicinity of the AOA. The TIC lists definitions for each Navy OPFAC. Table 4-2 lists the Marine Corps OPFACs and their Navy counterparts.

4.4. Employment of Systems

4.4.1 General. Employment of systems occurs within the context of the Marine Corps as a force in readiness. The goal is to maintain a force that is ready, responsive and capable of fighting whenever and wherever called upon. To meet this goal the Marine Corps maintains active Fleet Marine Forces of three combat divisions, three aircraft wings and supporting organizations. These forces are task organized as teams of combined arms with an integrated command and control system under a single commander. The designation of a single commander supports the principle of unity of command in the Marine Air Ground Task Force (MAGTF). Within this structure unity of command and control is achieved through employment of integrated communications and information systems. Where tactically and logistically feasible, automated systems will be employed so that information can be automatically generated processed, distributed, and displayed.

4.4.2 MAGTF Organizations. The three basic sizes of MAGTF are:

- Marine Amphibious Unit (MAU)
- Marine Amphibious Brigade (MAB)
- Marine Amphibious Force (MAF)

The MAU is built around a battalion landing team and a composite helicopter squadron. The MAB is built around a regimental landing team and a provisional Marine aircraft group. The largest MAGTF is the MAF which may

range in size from less than a division/wing team up to several divisions and aircraft wings, together with combat service support organizations. Regardless of size, the MAGTF will include four major components:

- o Command Element
- o Ground Combat Element
- o Aviation Combat Element
- o Combat Service Support Element

Command elements are organized as full time staffs which provide continuity of effort for planning and coordination of assigned ground, aviation and combat service support elements. As an example they assign units to Maritime Pre-Positioning Ships (MPS) as they are loaded and put afloat.

Organizational structure and employment concepts do not significantly change the AIS requirement. AISs and their data bases are tools the commander can use to control and manage resources. For example, the equipment and supplies on the MPS ships are listed in ADPE-FMF format by Marine Corps Logistics Support Activity (MCLSA), Albany, Ga. The personnel are listed by Reporting Unit Code (RUC) from the Marine Corps Base (MCB) where they originate. The Marines are flown to meet the ships and are provided equipment to accomplish the assigned mission. The resulting unit and information link-up provides a fully equipped MAGTF with personnel files to support JUMPS/MMS or REAL FAMMIS and logistics files and data bases to support SASSY/MIMMS or M3S. The MPS shipping and personnel were loaded and/or stored by SEMS/CAEMS. To use these AIS data bases properly, however, the MAB Commander would require a DFASC or MASC to handle all manpower and logistics functions.

There are eleven systems identified as AISs which will deploy with FMF units and will be required to function in combat. Most of these systems use three major data bases, i.e., manpower, ground logistics, and aviation logistics as the data base source of information to support them. CAEMS, MAGTF LIFT II, and UNITREP, for example, are dependent upon information from these data bases for data input.

A major task of the deployed AISs in the combat ashore environment is to aid in the general support of FMF resources by reporting resource usage and capability. Management activities that use this information include those involved in planning, accounting, inventorying, requisitioning, budgeting, and scheduling--activities that occur on a predictable and recurring basis - both in the MAF and at Commands external to it.

These information system also serve the FMF commanders and their staffs at all levels, and via these offices upward to the MAF commander. The impetus to improve the information processing support ashore stems from the need to:

- o Maintain resources at the highest achievable readiness condition.
- o Integrate management information to minimize the number of forces required to conduct support functions.
- o Provide the essential coupling between the deployed MAF, its parent organization, and the remainder of the Marine Corps Supporting Establishment.
- o Integrate the mode of operation to minimize the transition shock involved when phasing into a combat ashore environment.

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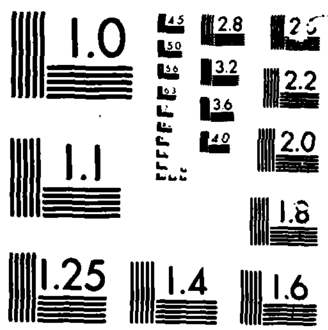

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These can become harder to accomplish because of the environmental conditions of the operation, i.e., duration and length of time to phase ashore, land/water separation of units and geographical separation of CSS and aviation units from forward ground units. The implications of this environment dictate an emphasis on several characteristics of an AIS to achieve success:

- Subsystem autonomous operating capability or high availability interconnections and communications circuits.

- The mobility of ashore ADPS components so that they do not detract from the mobility of the using unit.

- Means for integrating the operations of units afloat and ashore by exchange of information between the separated units.

- Flexibility to expand the system size and span of support to satisfy the requirements imposed by varying intensities and durations of operations ashore.

Finally, a principal concern in the combat ashore environment is to maximize the number of personnel performing combat functions within the resource constraints of the MAGTF. It is essential, therefore, that AISs not burden units operating in the combat environment. Thus, the AISs ashore should be designed with the following considerations:

- The ADPE and procedures used in the deployed, combat environment should be the same as those used, and trained on, in the garrison environment.

- Deployed AIS applications should be directed toward those functions that will increase the availability of human and material resources--either by reducing the time to perform tasks, shifting the people who perform the tasks or by increasing the management capability of the FMF commanders.

- The AIS must be simple, reliable and maintainable to the degree that it achieves a high degree of availability to perform its designated tasks.

Today, system users are accomplishing these ends by the use of ADPE-FMF and EUCE resources in the AOA. The ADPE-FMF and EUCE, organic to the elements of the MAB, provide update (source entry) and local support to the Commander. They are not large enough to support the MAB/MAF Commander without a DFASC or MASC. Workstation equipment or personal computers are common in the FMF and are extended components of the ADPE-FMF with more capability to perform tasks, analyze data and prepare input to Class I systems. These workstations will become standard for Marine Corps Class I systems during Phase III of the End User Computing Equipment Program which will be implemented in 1987. At that time the many different personal computers and terminals present in the Marine Corps today will be replaced with a Marine Corps standard microprocessor suite. This equipment will be used at the AISOPFACS and is critical to the MAGTF data transfer requirements study as the extension of systems communications requirements within the AOA.

There are fourteen AISOPFACs identified as Marine Corps agencies. All perform unique functions in planning and then supporting combat support and combat service support functions in a tactical operation. Table 4-3 depicts the AISOPFACs by functional groupings, the AISs they use, the outside agencies they support, the TDS OPFACs they exchange information with and the TDSs the TDS OPFACs use to support the commander. These functions are depicted in the Top Level Multiple Agency Sequence Diagrams in figures 4-6 thru 4-18.

4.5 Logistics Concept of Operation

The logistical concept of operations involves the planning and execution of providing the necessary supplies and maintenance activities ashore at all times. During the planning phase logistical support estimates for consumable items, end items and spare parts are made and approved. They become part of the supplies carried to the AOA. Arrangements for consumable supplies are identified and made. Figure 4-5 is an example of a chain of support in Europe.

During the assault phase, supplies and maintenance support are built up in the Beach Support Area (BSA) and helicopter support areas as planned. Supplies and maintenance are requested from the supply activity within the Shore Party elements. Supply support is provided from floating dumps, unit prescribed levels in the support areas and landed supplies. Shore Party reports status to the SMU/MMU. When the TLOC and its supporting SMU/MMU elements are ashore they receive the requests from the units.

The TLOC has been accounting for expenditures and maintenance items from the beginning. The TLOC has also planned and coordinated the movement of items to the receiving units. Requests during the first stages of the operation are such that they could be sent to Shore Party by DCT or a short radio message. Supplies and items will be located using the loading tables

Table 4-3. AISOPFAC/TDS OPFAC Relationships

OUTSIDE AISOPFAC	AIS	AGENCY	OPFACs	TDSs
G-4/S-4 SMU MMU TLOC SCA	SASSY/MIMMS M3S SEMS/CAEMS MAGTF LIFT UNIT REP	HQMC MCLB, Albany, Ga JCS Chain	COC-MAGTF COC-GE TACC	TCO MIFASS TAOM
AVN SUP AVN MAINT	3M SUADPS NALCOMIS FREDS	COMNAV AIR NAMSO HQMC ICP, Navy	TACC COC-MAGTF	TCO
G-1/S-1 ACU Disbursing/JUMPS	JUMPS/MMS REAL FAMMIS UNIT REP	HQMC FMF Cmdr. JCS Chain MCFC, K.C. Vet. Admin	COC-MAGTF COC-GE TACC	TCO
Disbursing/JUMPS S-4 Finance Comptroller CFAO	DOV MAGFARS SABRS	MCFC, K.C. NAV Compt. HQMC		
DFASC MASC	JUMPS/MMS REAL FAMMIS SASSY/MIMMS M3S UNIT REP SEMS/CAEMS MAGTF LIFT MAG FARS	MCFC, K.C. CDPA, K.C. HQMC CDPA, Albany, Ga CDPA, Quantico, Va	COC-MAGTF COC-GE TACC	TCO MIFASS TAOM

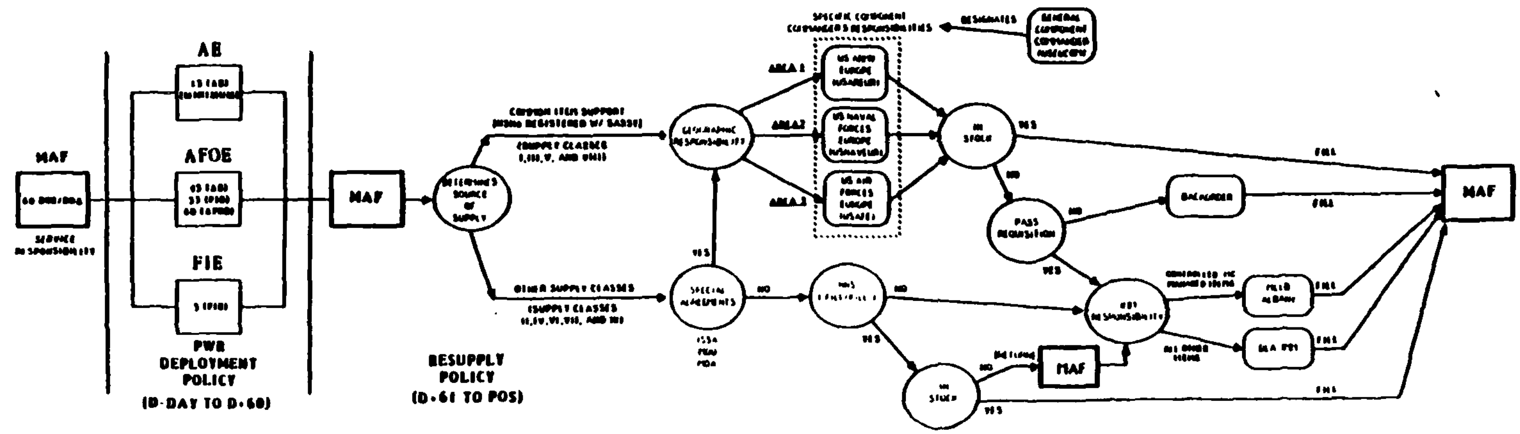

Figure 4-5. Supply Support Chain (EUROPE)

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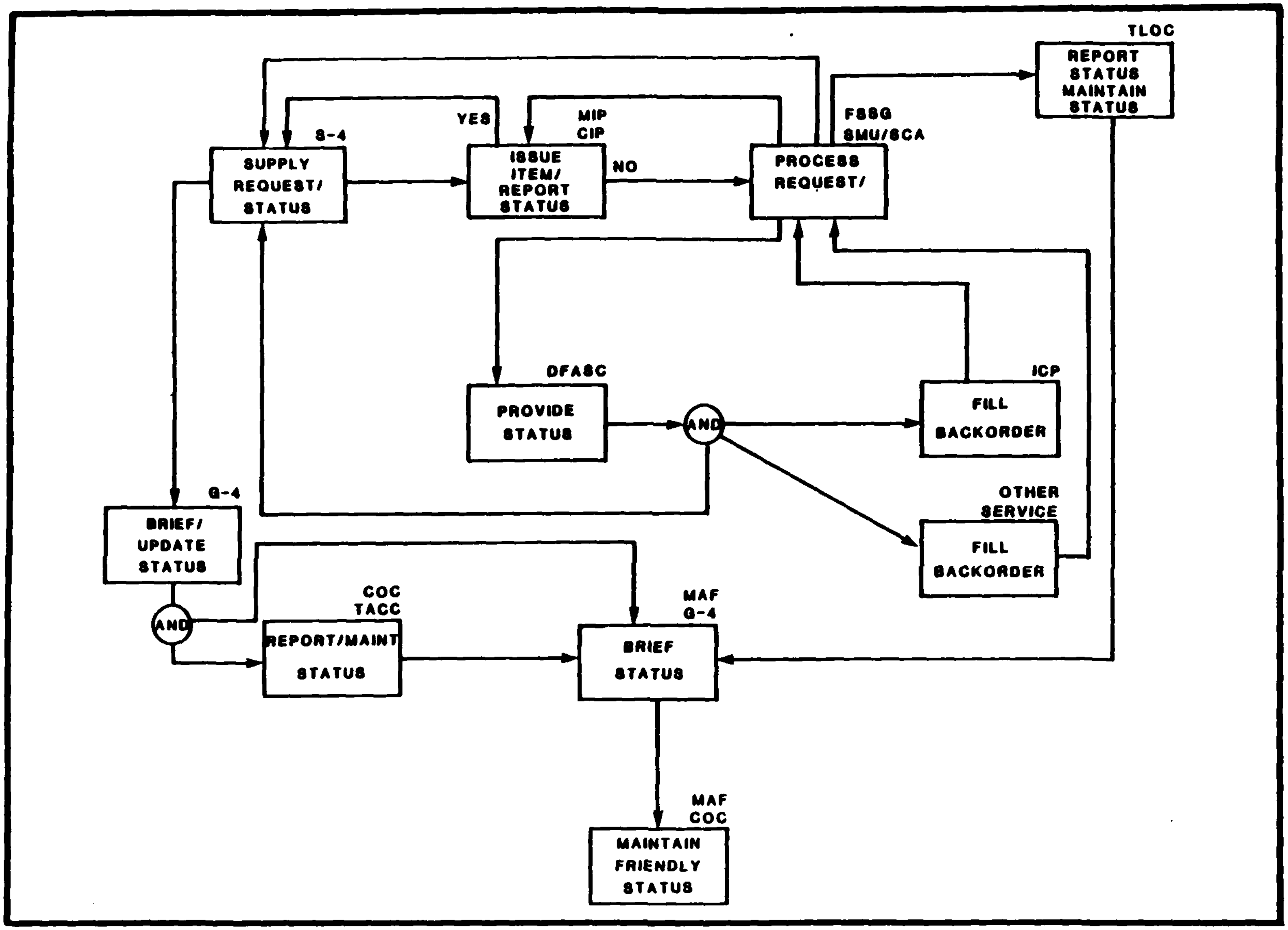

Figure 4-6. MASD for Supply Support Reporting (M3S)

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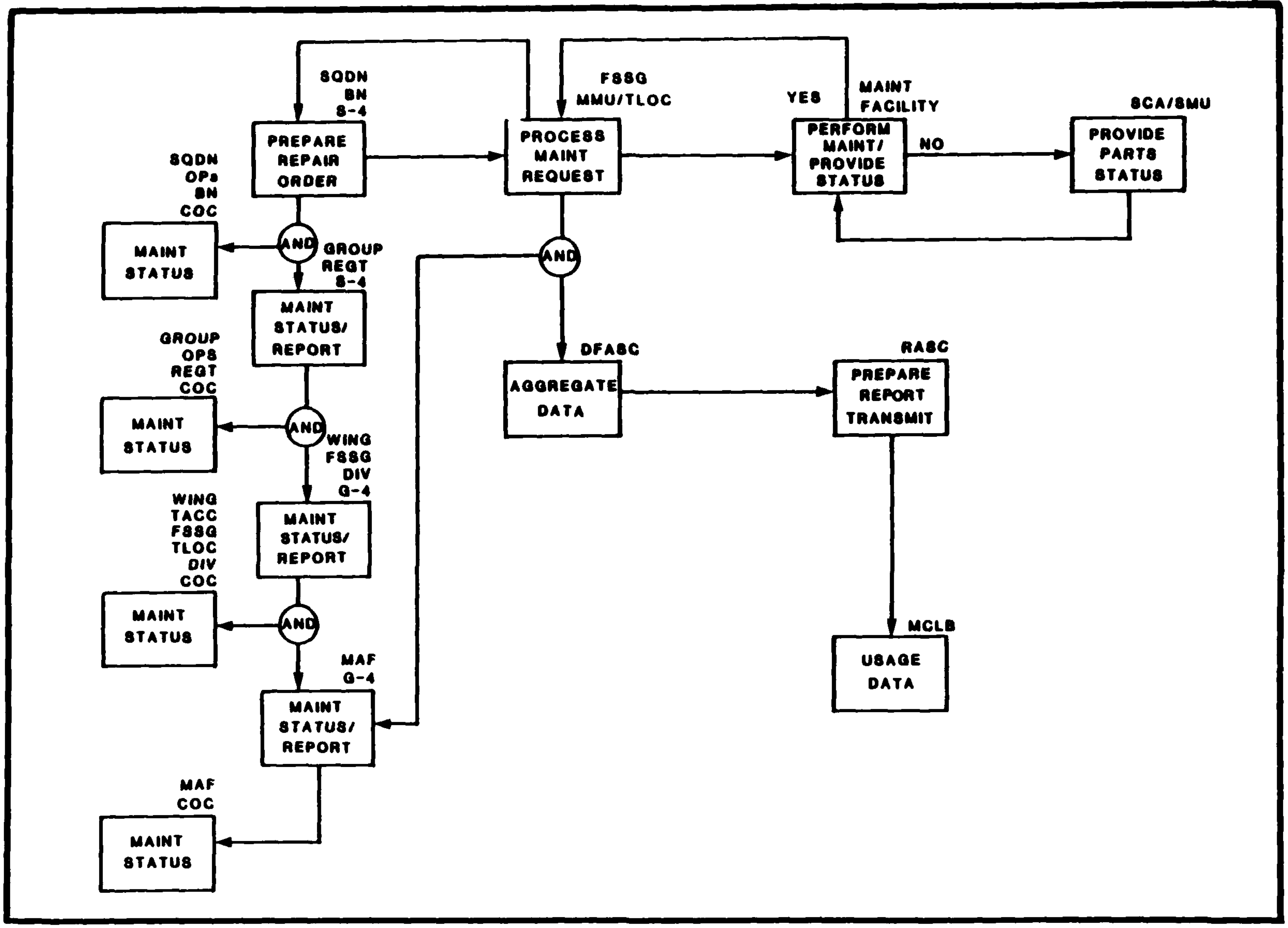

Figure 4-7. MASD for MIMMS (M3S)

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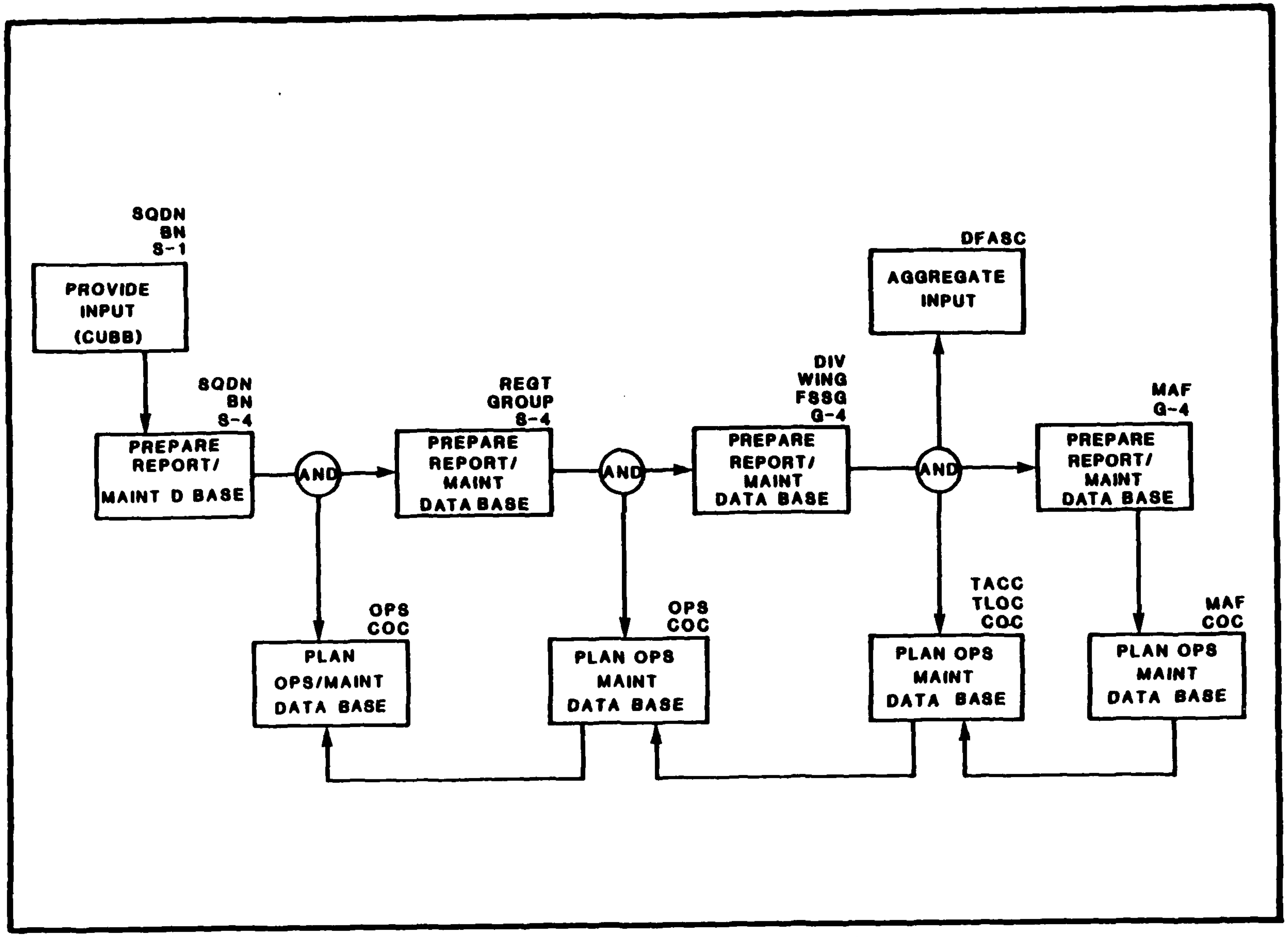

Figure 4-8. MASD for CAEMS

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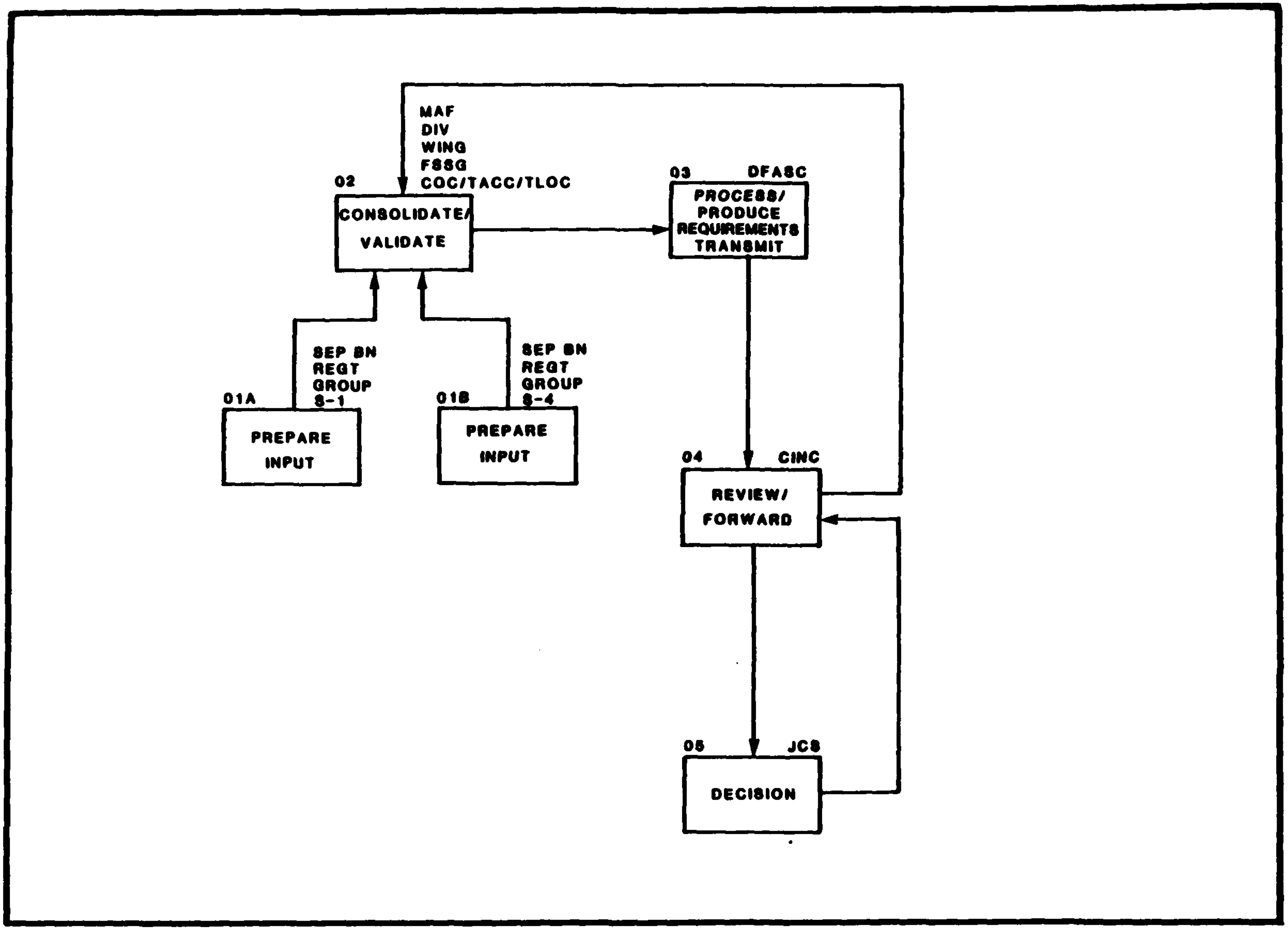

Figure 4-9. MASD for MAGTF LIFT II

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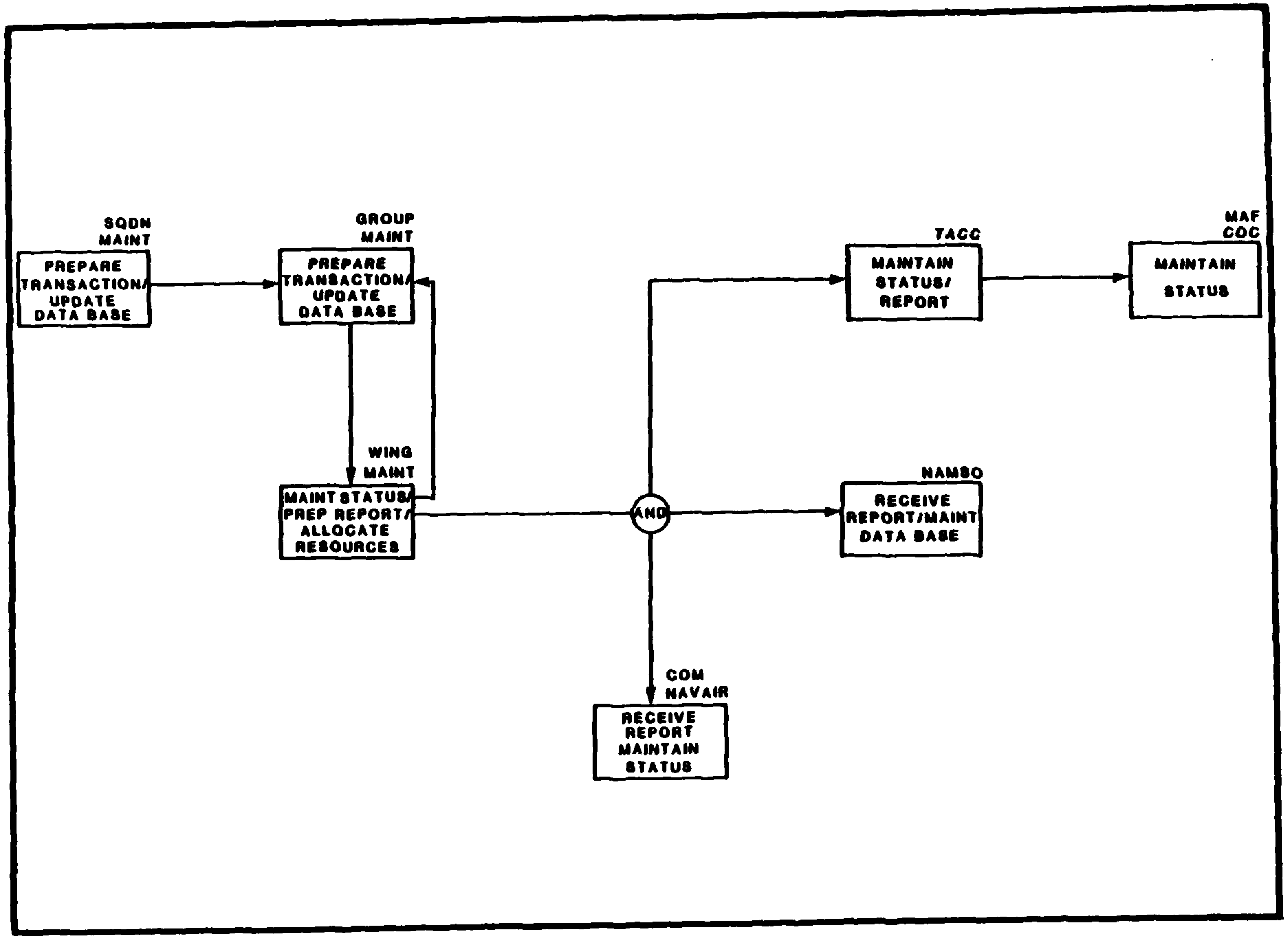

Figure 4-10. MASD for 3M

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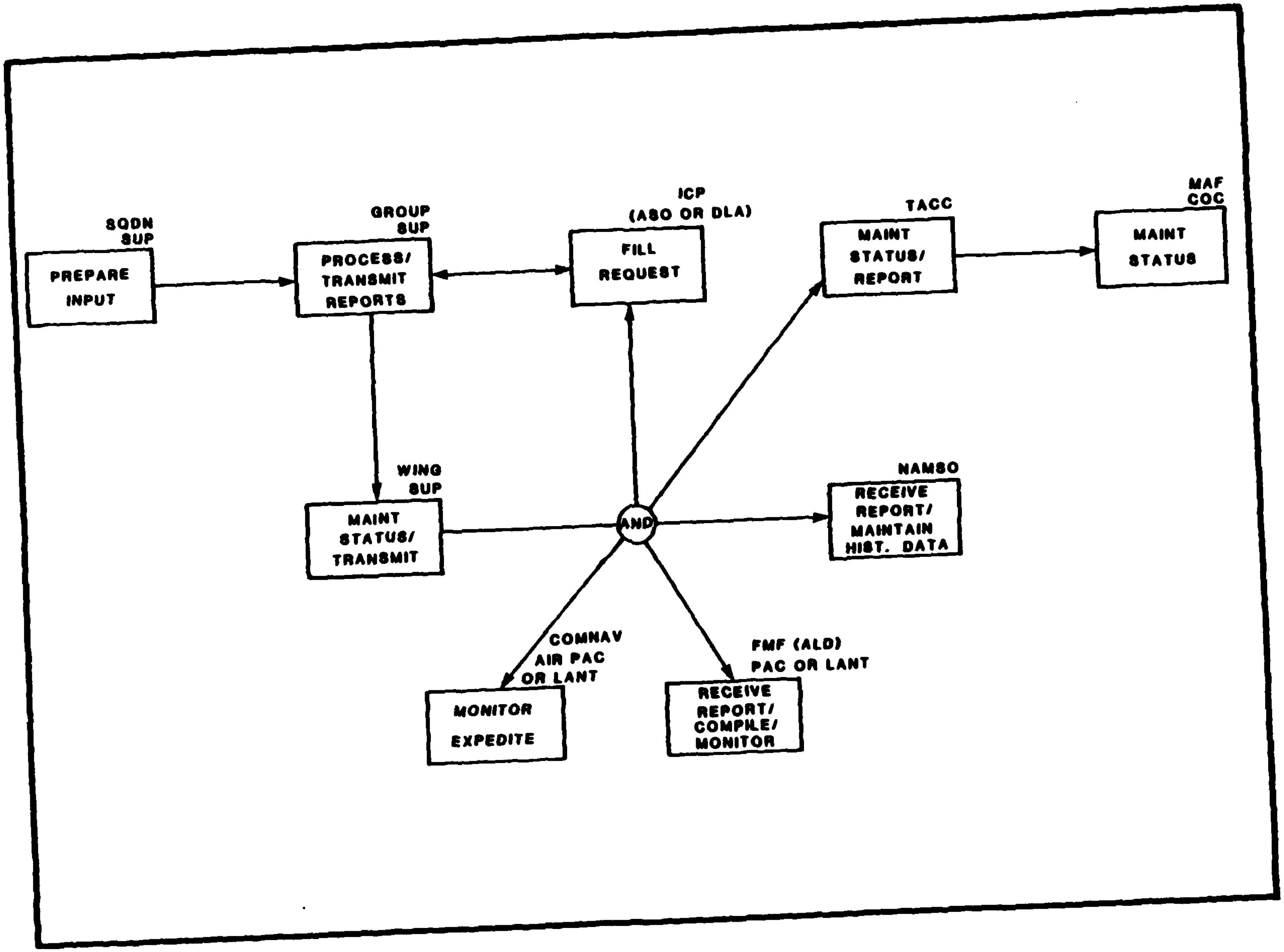

Figure 4-11. MASD for SUADPS

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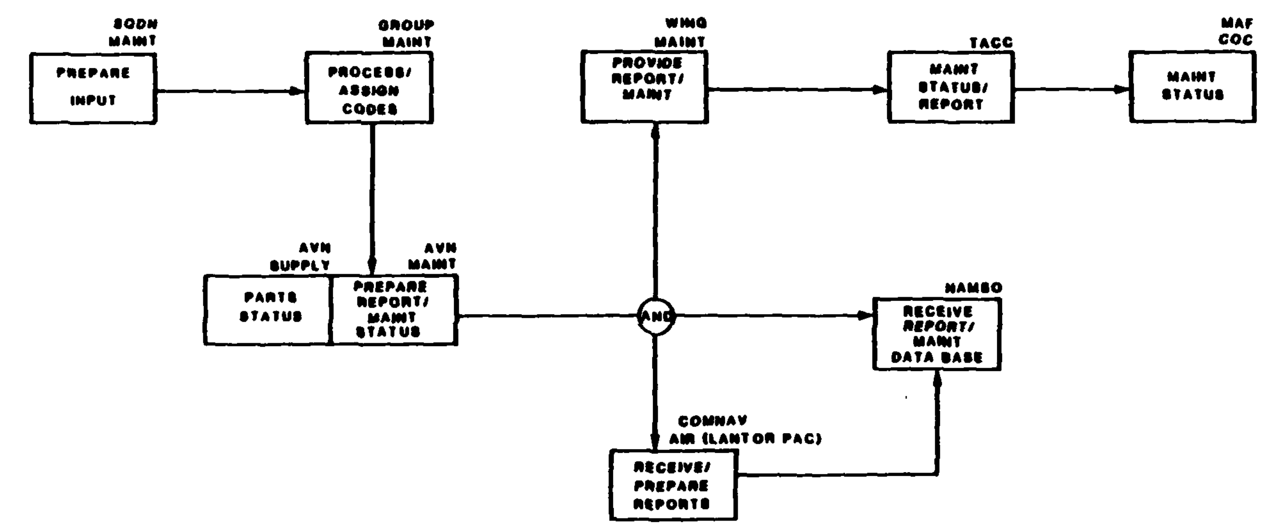

Figure 4-12. MASD for NALCOMIS

developed by SEMS/CAEMS. Once units have been ashore for a period of time, and command posts are established, the ADPE-FMF and EUCE in units behind the infantry can be used to control supply and maintenance support. Messages should still be short and use standard formats for transactions and information exchanges.

Logistics information will flow between the AISOPAC and TDS OPFAC nodes as shown in the Interface Matrix table 4-4 and the MASDs figures 4-6 through 4-12. This information exchange of supply and maintenance status keeps the Commanders appraised of his friendly force status and capabilities. He can plan more effectively how to use his forces. The information exchange to external agencies will alert them to problems that require their action to support the Commander.

The Aviation Supply and Maintenance functions occur for the same reasons but are handled by the Aviation Supply and Maintenance communities aboard ship or at a fixed site. Their primary function is to keep aircraft available to fight. Each squadron and MAG has its own supply and maintenance capability. The emphasis is at the MAG. The ADPE used is Navy equipment, hardwired between the squadron and the MAG. The only communications requirement for Aviation Supply and Maintenance is external to the AOA except for the information exchange with the Wing Commander and the MAGTF Commander on aircraft availability and capability.

4.6 Manpower Concept of Operation

As shown in figures 4-13 through 4-15 the major manpower functions are casualty reporting, unit status by unit diary reporting and replacements. Initial casualties and their replacements are part of the personnel estimates in the planning phase of the operation. Actual casualties, however, require a major effort for control and support. When casualties are sustained and taken from the battle, the Commander is still fighting.

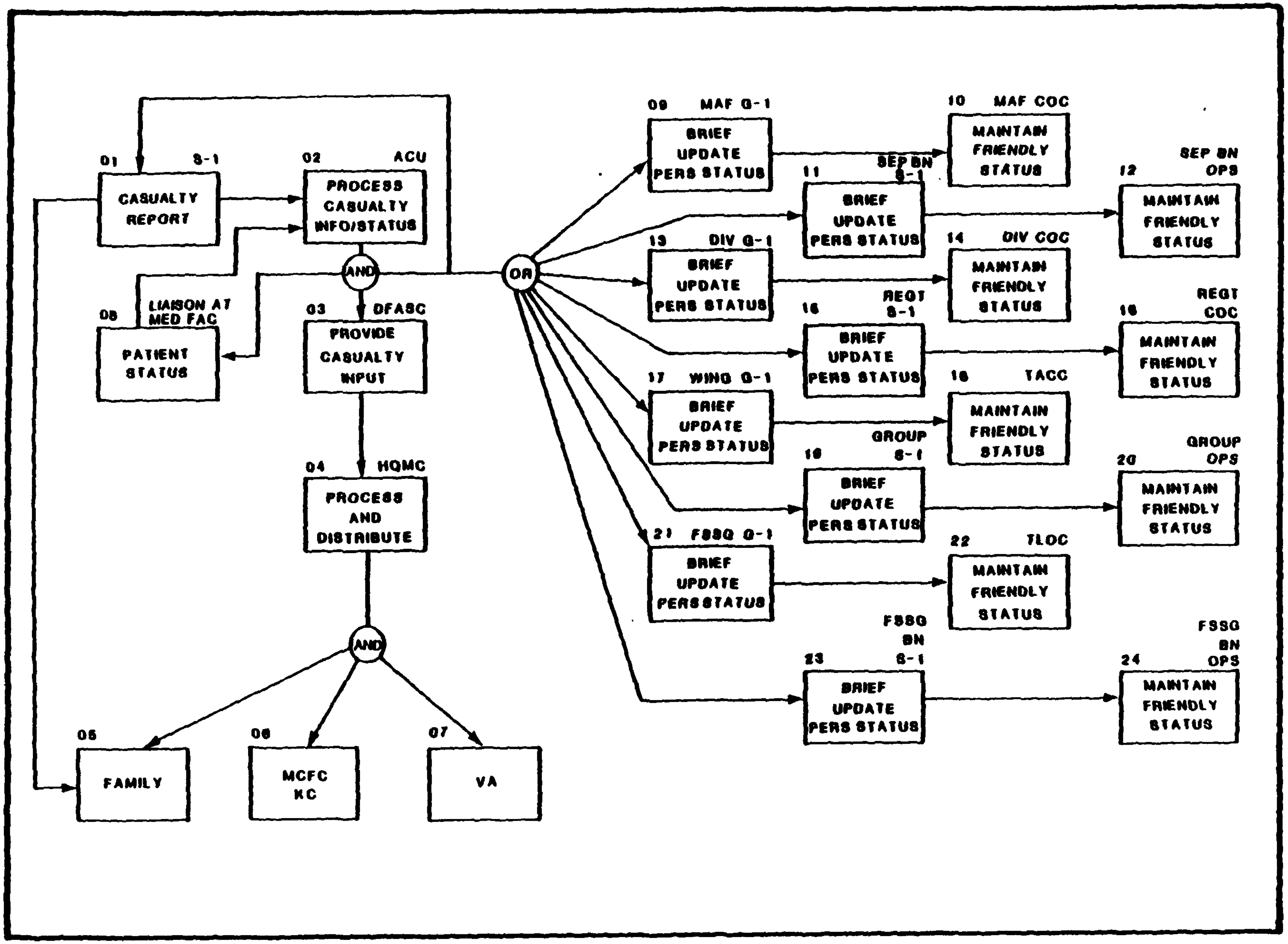

Figure 4-13. MASD for Casualty Reporting

Table 4-4. Marine Corps OPFACs/AISOPFACs

		OPFACS						AISOPFACS													
		COC-MAGTF	COC-GE	FSCC	DASC	FDC	TACC/TADC	G-1/S-1	ACU	G-4/S-4	SMU/SCA	COMPTROLLER	AVN SUPPLY	AVN MAINT	TLOC	DISBURSING	FINANCE	MMU	CFAO	DFASC	MASC
OPFACS	COC-MAGTF		X	X	X		X	X	X	X					X						
	COC-GE	X		X	X	X	X	X	X	X					X						
	FSCC	X	X		X	X	X			X					X						
	DASC	X	X	X			X			X					X						
	FDC		X	X						X					X						
	TACC/TADC	X	X	X				X	X	X			X	X	X						
AISOPFACS	G-1/S-1	X	X				X	X	X	X		X			X	X	X			X	X
	ACU	X	X				X	X								X				X	X
	G-4/S-4	X	X	X	X	X	X	X		X	X	X			X		X	X		X	X
	SMU/SCA									X	X	X			X	X	X	X	X	X	X
	MMU									X	X	X			X					X	X
	AVN SUPPLY						X						X	X							
	AVN MAINT						X						X	X							
	TLOC	X		X	X	X	X	X	X	X	X	X				X	X	X		X	X
	DISBURSING							X	X	X	X	X			X	X				X	X
	FINANCE							X		X	X	X			X		X	X		X	X
	COMPTROLLER							X		X	X	X			X	X	X	X	X	X	X
	CFAO										X	X									
	DFASC							X	X	X	X				X	X	X	X			
	MASC							X	X	X	X				X	X	X	X			X

X = INFORMATION EXCHANGE REQUIREMENTS

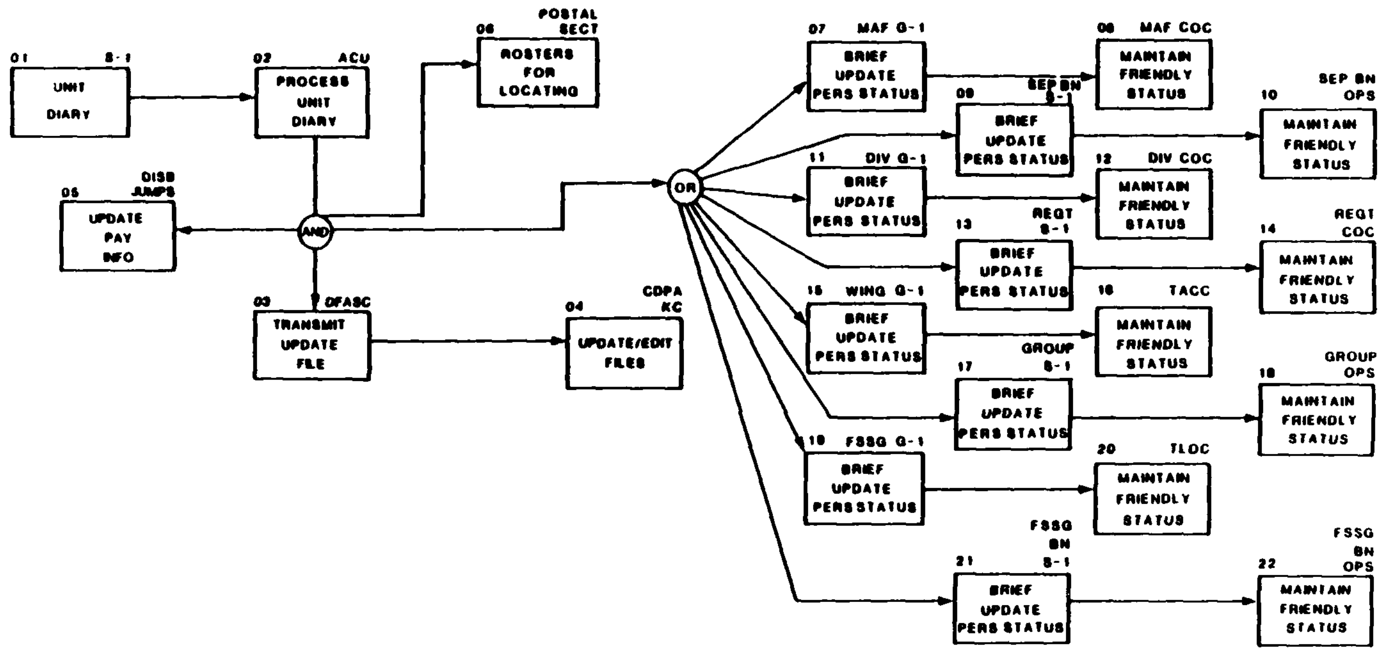

Figure 4-14. MASD for Unit Diary Reporting

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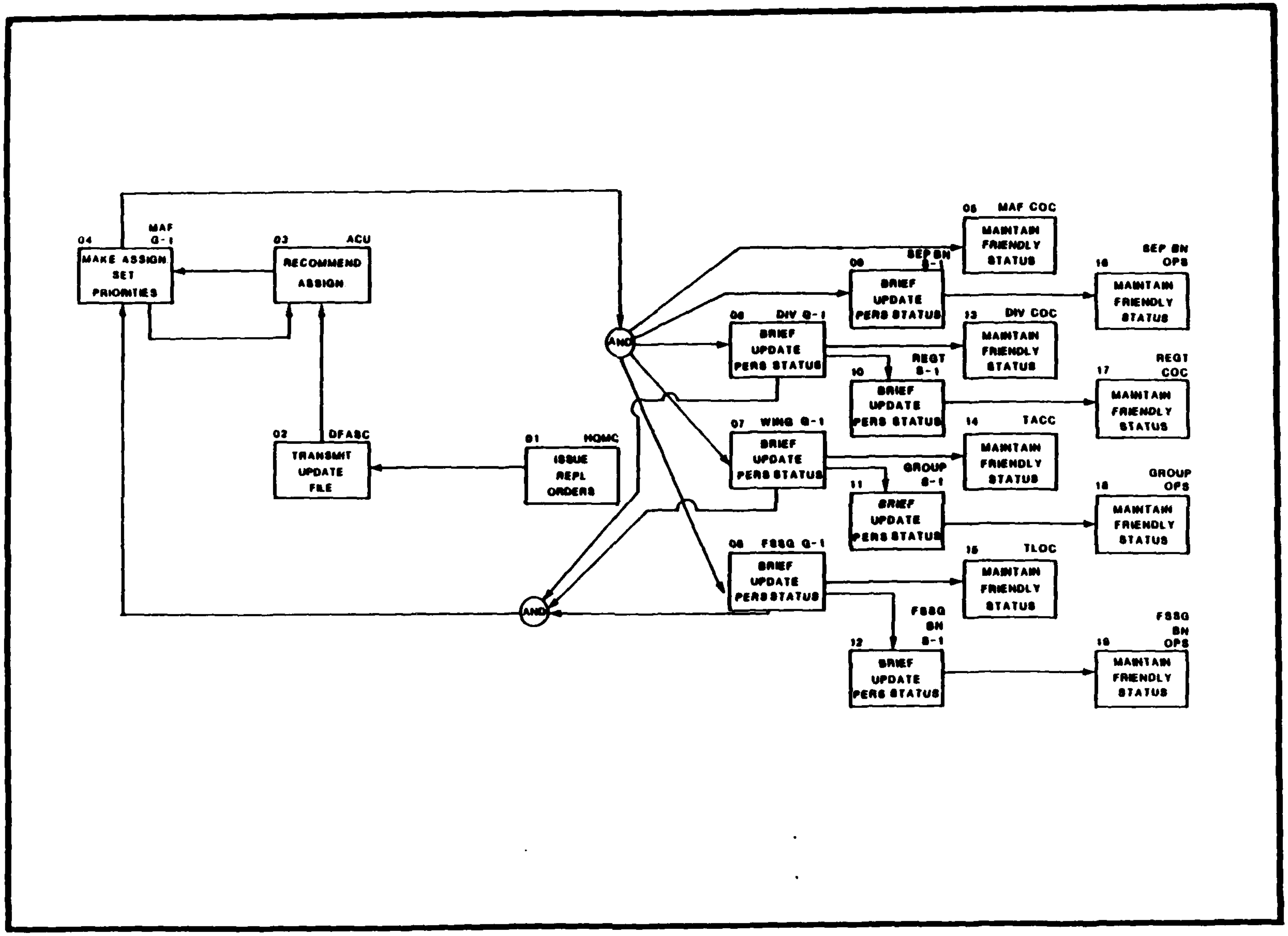

Figure 4-15. MASD for Replacement Reporting

The casualties are taken rapidly to a medical facility, treated and maybe transferred to another facility. The Commander has many responsibilities but little time at this point. A focal point is required to support him. This focal point can be the ACU with the DFASC. The Commander sends a short message by radio or DCT listing the name, SSN, rank of the casualty to the COC with a copy to the ACU. The ACU working with his liaison at the medical facility gets the casualty status portion of the casualty message; from the DFASC manpower data base the remainder of the message required from the field is obtained, completed and sent. The unit diary entry can also be made. The information is backfed to the fighting unit and status information is forwarded to the appropriate G-1/S-1's. This method would be used from D-Day on for units on the move and fighting. Units which are stable enough to establish electrical power and multichannel systems will use their ADPE-FMF equipment or EUCE equipment for all phases of manpower reporting and management.

4.7 Operational and Financial Concepts of Operation

UNIT REP changes, FREDS, MAGFARS, SABRS and DOV information is developed from transactions occuring in Logistics and Manpower Systems and are by-products of other actions. The outputs, however, provide force readiness and resource expenditure data information are essential both at the MAGTF and national levels. The MASDs for these systems are shown in figures 4-16 through 4-18.

4.8 Summation

These MASDs are only the top level. Information exchange requirements need to be specified and defined as to format, time, etc. to make them complete. They can then be used in the Information Exchange Data Base being developed by the System Integration Branch of C^3 Division, Development Center.

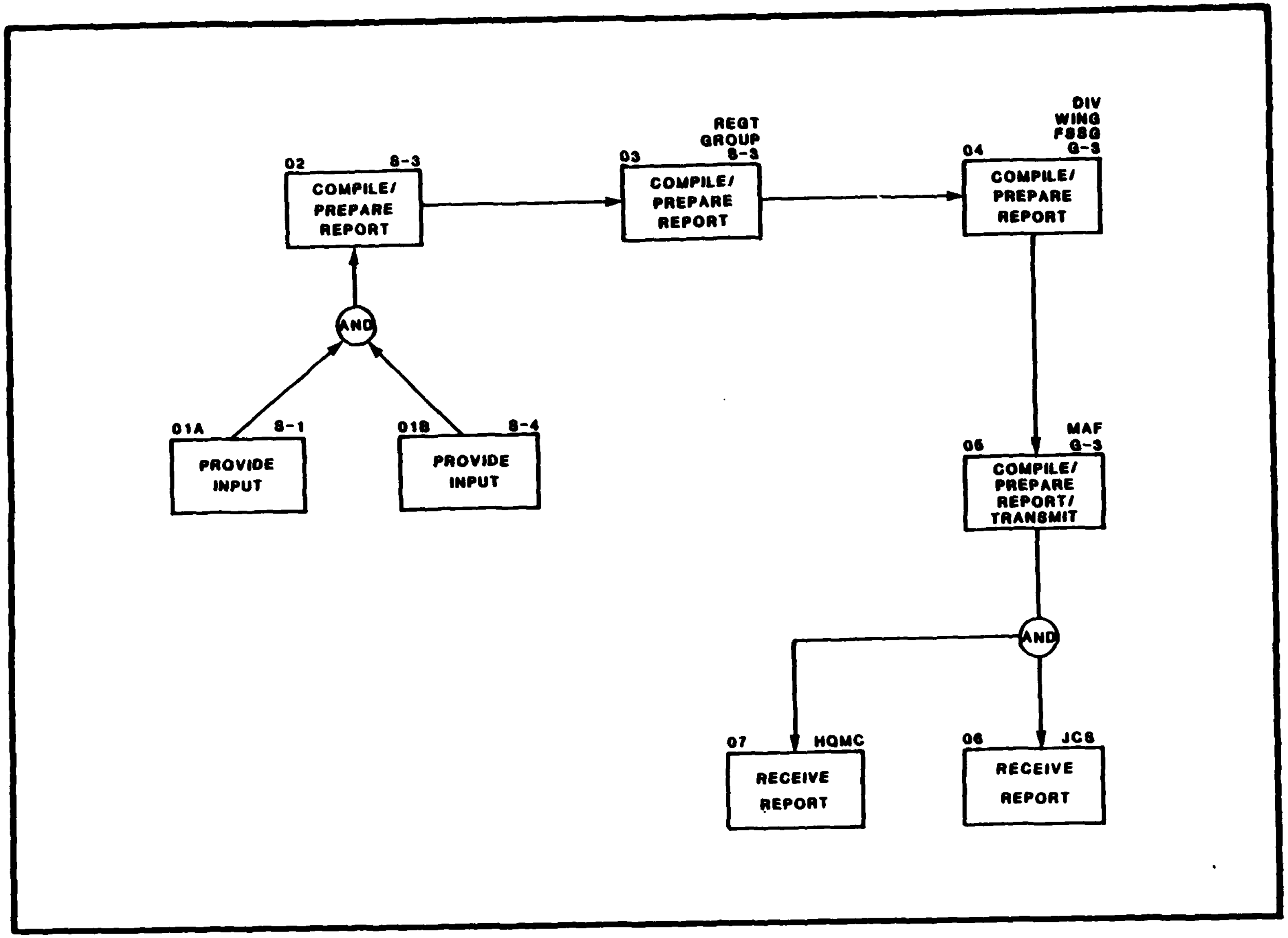

Figure 4-16. MASD for UNIT REP

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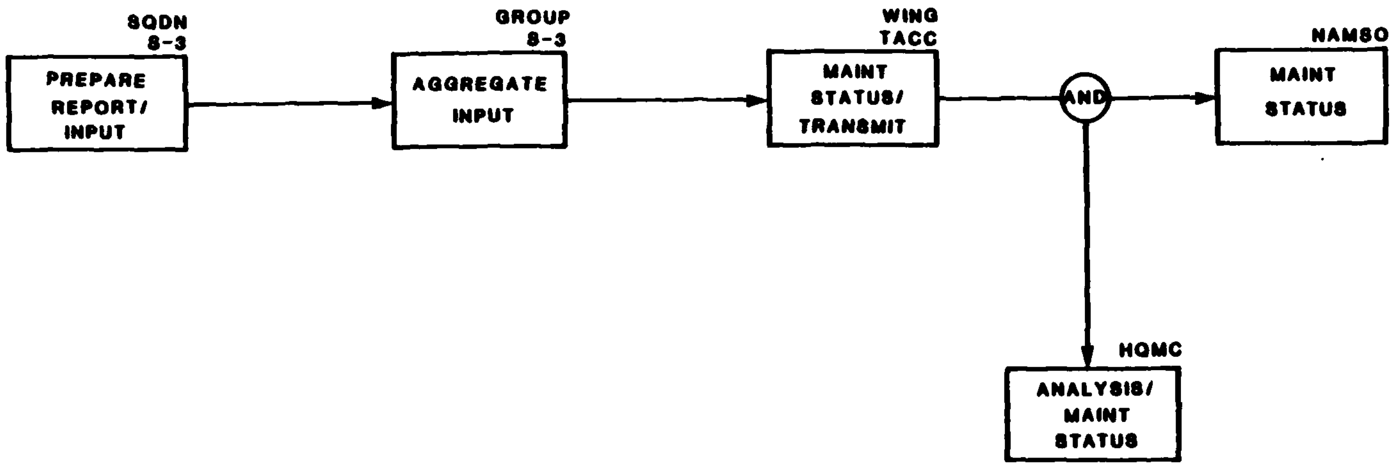

Figure 4-17. MASD for FREDS

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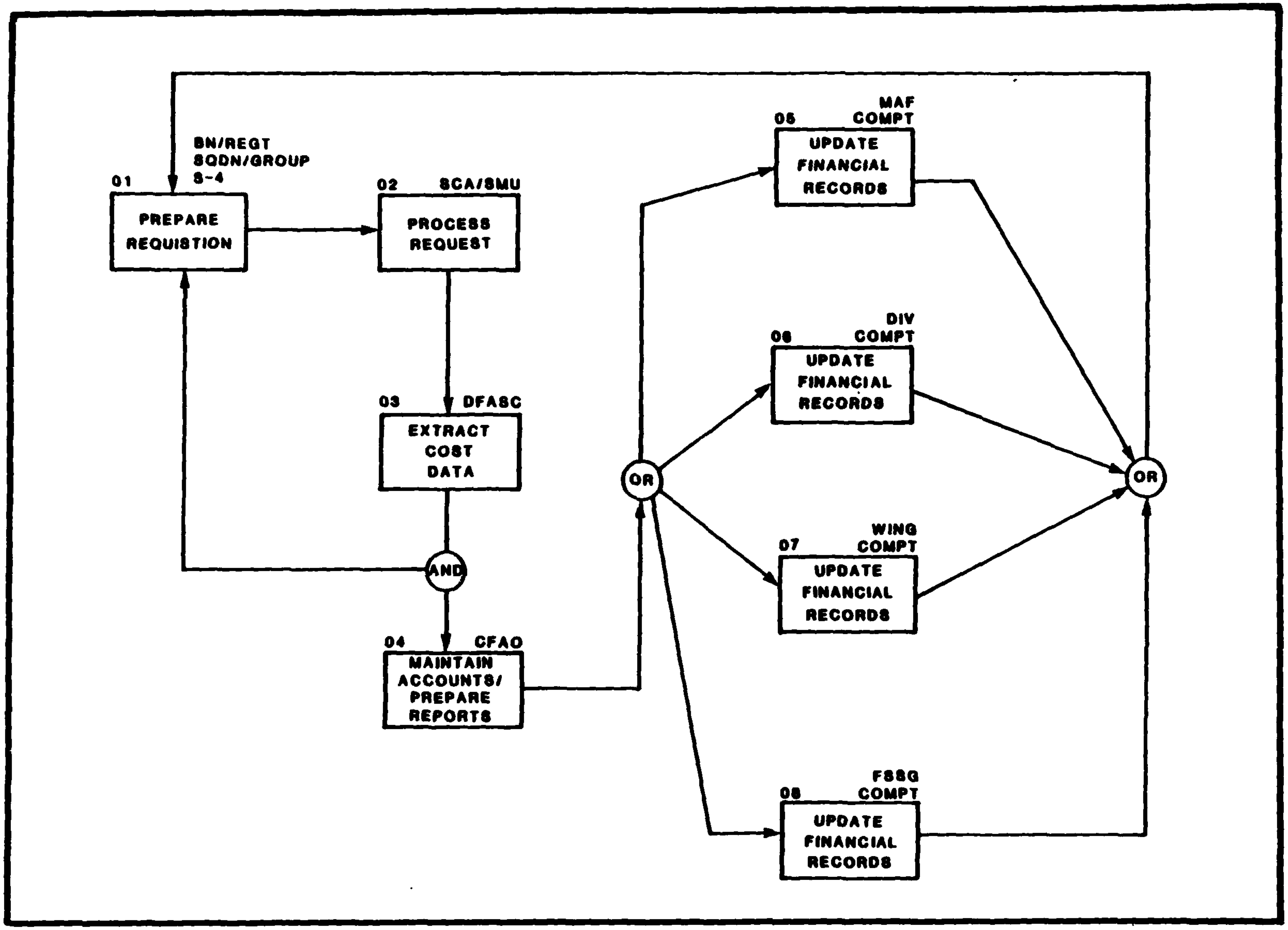

Figure 4-18. MASD for MAGFARS and SABRS

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SECTION 5. COMMUNICATIONS

5.1 General

Data transfer alternatives are governed by the availability and capacity of communications resources. The purpose of this section is to describe the landing force communications capabilities expected to be available at the key nodes in the MAGTF network in 1986 and 1991. These points were selected because the majority of new communications equipments will be introduced between those dates. The following information is covered:

- Discussion of the MAGTF communications concept
- Outline of the interface requirements
- Description of selected equipments
- Diagrams of equipment configurations by major communications nodes in 1986 and 1991

5.2 Communications Conceptual Background

The evolving communications architecture in the FMF and AOA is the Landing Force Integrated Communications System (LFICS). This represents the overall Marine Corps tactical communications network, consisting of all personnel, equipment and data required for communications in the Fleet Marine Force.

LFICS is partially analogous to many of the full-service commercial communications networks. It includes all of the communications methods and resources necessary for fulfilling the FMF commander's data and voice transfer requirements in the MAGTF/AOA environment.

As such it is the source of single-channel point-to-point and net radio communications, tactical digital information links (TADILs), and switched/non-switched multichannel communications both within and external to the AOA. Ideally, the LFICS would be transparent to and not constrain the introduction, use and evolution of requirements. Realistically, this will not occur because of the loose linkage between technologies in data systems and communications.

The analogy to commercial communications serves to put the requirement in both operational and technological perspective. Operational demand is following a national trend of accelerating requirements for on-line data processing capability. Extension of that demand to the AOA is largely due to a standing need and technological advances in commercial computers which is making their use in combat zones more practical. Concurrently, technical advances are also improving the capability of tactical communications systems. There does, however, tend to be a lag between the demand and the capabilities of the communications system. It is in this context that MAGTF data transfer alternatives must be developed.

In addition to the technological gap, the LFICS is constrained by changes in missions, the tactical situation and resulting changes in priority. The C2MP acknowledges this by stating that while, "a limited number of sole-user communications facilities may be provided to meet the essential needs of highest priority, the basic concept is to configure the LFICS as a common user system."

5.3 External Connectivity

The landing force integrated communications system provides the ability required to communicate with other Department of Defense (DoD) and allied agencies. This external connectivity covers strategic/tactical voice,

data, and record traffic communications needed for joint and combined operations. The specific scenario used in this study involves U.S. Marine Corps and Navy forces. The interchange of information between Marine Corps OPFACs and selected Navy OPFACs as well as the interchange of information between Marine Corps OPFACs and Marine Corps AISOPFACs is the focal point of this study. Table 5-1, Navy-Marine Corps OPFACs Interface Matrix shows the required connectivity for information exchange.

5.4 Internal Connectivity. For internal MAGTF communications, the landing force integrated communications system provides the means for voice, data, and record traffic transfer between users such as OPFACs, AISOPFACs, communications/switching centers, and individual subscribers. Table 4-4 illustrated the information exchange requirements between Marine Corps OPFAC and AISOPFAC. Information is derived from reference (vv), the Technical Interface Concepts of April 1984 and the AIS OPFAC Definition Report reference (be).

5.5 Communications Equipment

5.5.1 General. As previously noted, LFICS is the Marine Corps tactical communications network, consisting of all personnel, equipment and data required for communications in the FMF. LFICS is not a single system but rather an architecture of varying configurations and capabilities. The communications equipment, which comprises one part of this architecture is described in detail in the Command and Control Master Plan reference (oo). To minimize redundance, only those systems or equipment not covered by the Master Plan will be covered in detail in this section. The systems already adequately described in the Master Plan will be mentioned briefly for continuity.

Table 5-1. USMC-USN OPFACs Interface Matrix

		USMC OPFACS												USN OPFACS				
		COC-MAGTF	MC/INTEL	COC-GE	FSCC	DASC	FDC	TAOC	TADC/TACC	MATCS	SP	II	TERPES	CIC/(CF/C)	HDC	SACC	TACC(N)	IC (JIC)
USMC OPFACS	COC-MAGTF		X	X	X	X		X	X	X		X	X	X				X
	MC/INTEL	X		X	X	X			X			X	X					X
	COC-GE	X	X		X	X	X		X		X	X						
	FSCC	X	X	X		X	X		X					X		X		
	DASC	X	X	X	X			X	X	X					X		X	
	FDC			X	X											X		
	TAOC	X				X			X	X				X	X	X	X	
	TADC/TACC	X	X	X	X	X		X		X		X	X	X	X	X	X	
	MATCS	X				X		X	X						X		X	
	SP			X														
	II	X	X	X					X				X					X
	TERPES	X	X						X			X						X
USN OPFACS	CIC/(CF/C)	X			X			X	X						X	X	X	
	HDC					X		X	X	X				X			X	
	SACC				X		X	X	X					X			X	
	TACC (N)					X		X	X	X				X	X	X		
	IC (JIC)	X	X									X	X					

X = INFORMATION EXCHANGE REQUIREMENTS

5.5.2 Equipment Categories. The Master Plan divides communications equipment into four categories. These are:

- o Subscriber/Terminal equipment
- o Switching equipment
- o Tactical Communications Control Facilities
- o Transmission Systems

5.5.2.1 Subscriber/Terminal Equipment. Subscriber/Terminal equipment are those communications devices normally used by a user in a wire network, e.g., telephones and teletype. For optimum utilization these devices usually require connectivity to a switching system. This allows the subscriber (user) to communicate with other subscribers within the same network.

The subscriber/terminal equipment expected to be in use in the 1986-1996 time frame are as follows:

TA-938	Telephone Set
TA-838/TT	Telephone Set
TA-312/PT	Telephone Set
TA-954( )/TT	Digital Non-Secure Voice Terminal (DNVT) (telephone set)
TSEC/KY-68	Digital Subscriber Voice Terminal (DSVT)
AN/UGC-74A(V)3	Communication Terminal (Teletype Writer (TTY)
CV-3591	Advanced Narrowband Digital Voice Terminal (ANDVT)
AN/TGC-46	TTY Central (part of AN/TSC-95 Communications System)

AN/PSC-2	Digital Communications Terminal (DCT)
TCC	Tactical Communications Center
AN/TYC-5A	Data Communications Terminal

Of the above, only the TCC is not previously described in the references.

5.5.2.1.1 Tactical Communications Center (TCC). The TCC is a tactical communications center that will replace the AN/TYC-5A and the AN/TGC-37 communication central. The system will consist of two shelters; the AN/MSC-63A and a Reproduction/Distribution Facility (RDF).

The AN/MSC-63A will have the capacity to terminate at least 20 full duplex serial circuits with 75-2400 bits per second (bps) data rates. Of these circuits, two will be capable of AUTODIN Mode I operation at 1200-2400 bps data rates and with interface capability to an AUTODIN SWITCHING center or the AN/TYC-39 TRI-TAC message switch. The AN/MSC-63A will electrically interface directly with both AN/UGC-74 TTY and ADPE-FMF/EUC equipment over serial circuits.

5.5.2.2 Switching Equipment. Switching equipments perform the function of connecting subscribers with one another. This is done either manually by an operator or automatically. The MTACCS timeframe switching equipment will be available for both message and circuit switching. These switches are:

Switching Equipment

Message Switch

- AN/GYC-7 — Unit Level Message Switch (ULMS)

Circuit Switches

o	AN/TCC-38(V)	Central Office, telephone, automatic
o	SB-3614	Switchboard, telephone
o	AN/TTC-42(V)	Central Office, telephone, automatic
o	SB-3865( )(P)/TTC	Switching Unit, telephone, automatic

The listed switching equipment are described in detail in references (oo) and (zz). No additions or deletions to this listing were anticipated at the time of this report.

5.5.2.3 Tactical Communications Control Facilities. The present tactical communications control facility, the AN/TSQ-84, in use in the Marine Corps today, is expected to still be in use during the study time frame (1986-1996). The system can only be used for analog circuits in its current configuration. During the conversion to digital communications, it is anticipated that the AN/TTC-42, central office telephone, automatic will also perform certain digital technical control functions. The AN/TSQ-84; communications technical control center, is described in detail in references (oo) and (bd).

5.4.2.4 Transmission Systems. Transmission systems comprise the largest group of equipment of the four categories. There are two types of transmission systems, single and multichannel. The systems expected to be in use in the 1986-1996 timeframe are:

Single Channel Systems

HF Radios:

o	AN/PRC-104	Radio Set
o	AN/GRC-193	Radio Set
o	AN/MRC-138	Radio Set
o	IHFR	Improved High Frequency Radio Short Term Anti-Jam (STAJ)

VHF Radios:

o	AN/PRC-77	Radio Set
o	AN/PRC-68	Radio Set
o	AN/PRC-119	Single Channel Ground and Air Radio System (SINCGARS)
o	AN/GRC-160	Radio Set
o	AN/VRC-12	Radio Set
o	TSEC/KY-67	Secure Transceiver (Bancroft)

UHF Radios:

o	AN/PRC-75A, 75B	Radio Set
o	AN/PRC-113	Radio Set
o	AN/MRC-138/UHF	Radio Set
o	AN/GRC-171A(V)2	Radio Terminal Set
o	AN/PSC-3	Manpack Satellite Terminal

Multichannel Systems

o	AN/GRC-201	Radio Set
o	AN/TRC-170(V)3	Radio Terminal Set
o	AN/MRC-135	Radio Terminal Set

o	AN/MRC-139	Radio Terminal Set Digital Wideband Transmission System (DWTS)
o	AN/TSC-95	Communications System
o	AN/TSC-96(V)	Satellite Communications Central
o	AN/TSC-85A	Communications Terminal, Satellite
o	AN/TSC-93A	Ground Mobile Forces Satellite Communication Terminal
o	AN/TSC-( )HFCT	High Frequency Communications Terminal

Most of the mentioned systems are described in reference (oo). The exceptions are the IHFR and the HFCT. The AN/MRC-139 is described in the C^2 Master Plan under the label AN/MRC-(XXX).

5.5.2.4.1 Improved High Frequency Radio. The improved high frequency radio with Short Term Anti-Jam (STAJ) capability is a U.S. Army program. This development will be applied to the HF radios already in the inventory (AN/PRC-104, AN/GRC-193, AN/MRC-138 and AN/MRC-138/UHF). The improvement will provide frequency hopping Electronic Counter-Counter Measures (ECCM) capability to existing Marine Corps high frequency transmission systems.

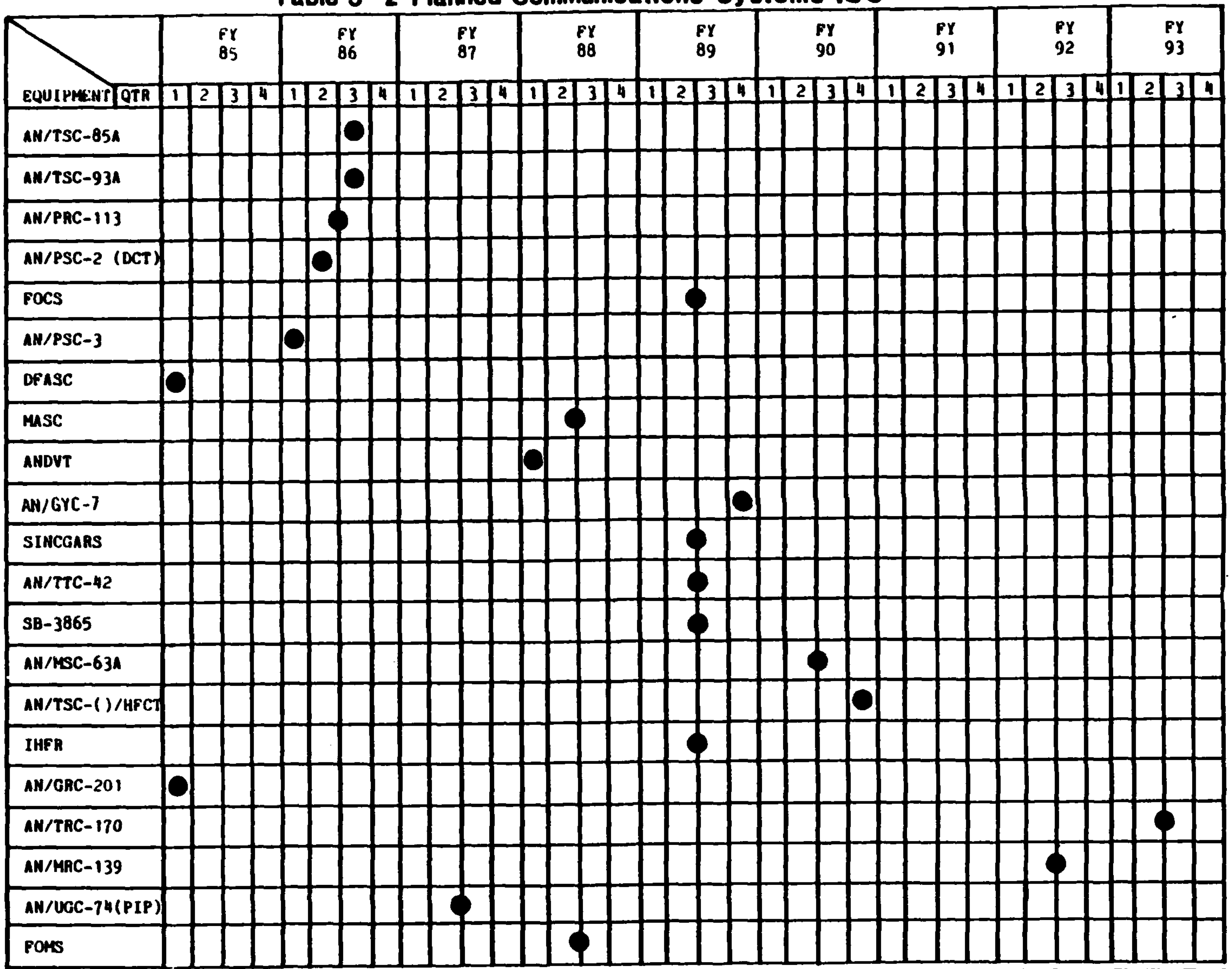
5.5.2.4.2 High Frequency Communications Terminal (HFCT). The HFCT will be a small rapidly deployable HF system to be used for long-range multichannel data and voice communications. The terminal will be vehicle mounted and a primary source for long haul communications for Marine Amphibious Units and Marine Amphibious Brigades. The HFCT will also serve as a back-up to other long-range communications systems such as the ground mobile forces satellite communications system or the fleet satellite communications system. Present planning calls for 16 systems to be provided for each Marine Amphibious Force.

5.5.2.5 Ancillary Communications Equipment. The Command and Control Master Plan categorizes a number of ancillary equipment under the four primary categories. At some point, a separate category of ancillary equipment should be established. This will avoid the confusion as in the C^2 Master Plan, where multiplexing equipment is first listed under switching facilities on page 5-9, but then later referred to as transmission equipment in Annex D. Communications Security (COMSEC) equipment is becoming more important and exists as both built-in and add-on systems. In a true sense, COMSEC equipment for the most part is ancillary equipment to subscriber terminal, transmission, and switching equipment systems.

An ancillary communications system, not included in the C^2 Master Plan, that may have an impact on the transmission of AIS data in an AOA, is the Fiber Optic Multiplexing System (FOMS). This system, in conjunction with the Fiber Optic Cable System (FOCS), is being developed as a lightweight cable system to replace the very bulky and heavy 26 pair amphibious assault cable system. These cable systems will be used to inter-connect switches and multichannel transmission systems within a node.

Ancillary communications equipment are listed in reference (OO) under multiplex equipment, modem equipment and COMSEC devices. As far as can be determined through interviews with acquisition managers, there have been no significant changes in procurement plans. The LFICS equipment information provided in the C^2 Master Plan is still relatively up to date. Major communications systems Initial Operational Capabilities (IOC) dates have changed, however, and the most recent planned IOC's are provided in table 5-2.

Table 5-2 Planned Communications Systems IOC



5.5.2.6 <u>Equipment Utilization</u>. Figures 5-1 to 5-7 depict the configurations of communications systems for 1986. Figures 5-8 to 5-14, show the equipment configurations for these same telecommunications nodes in 1991 (MTACCS). Section 6 of this report describes scenario dependent communications requirements employing these configurations.

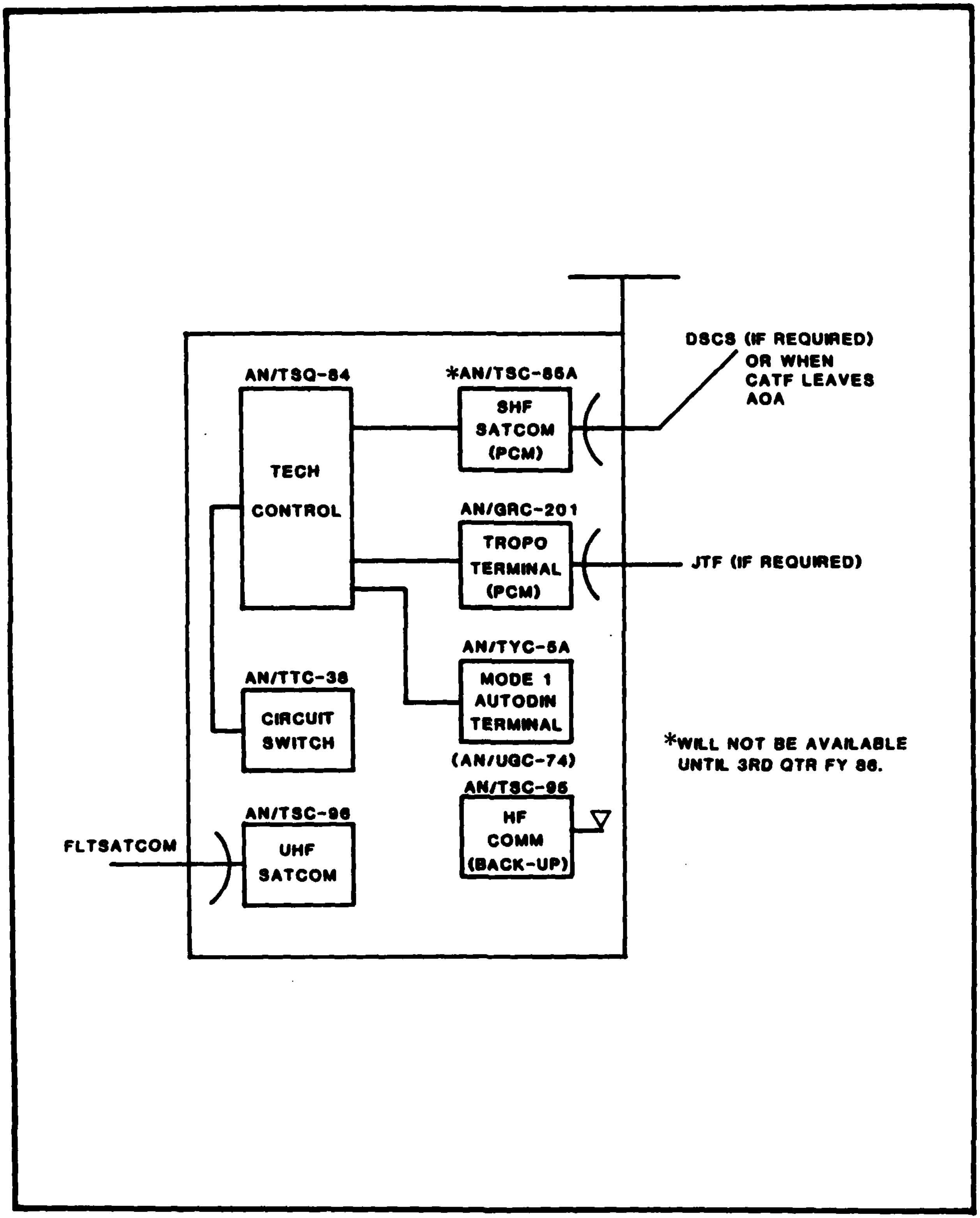


Figure 5-1. MAGTF (MAF) NODE 1985

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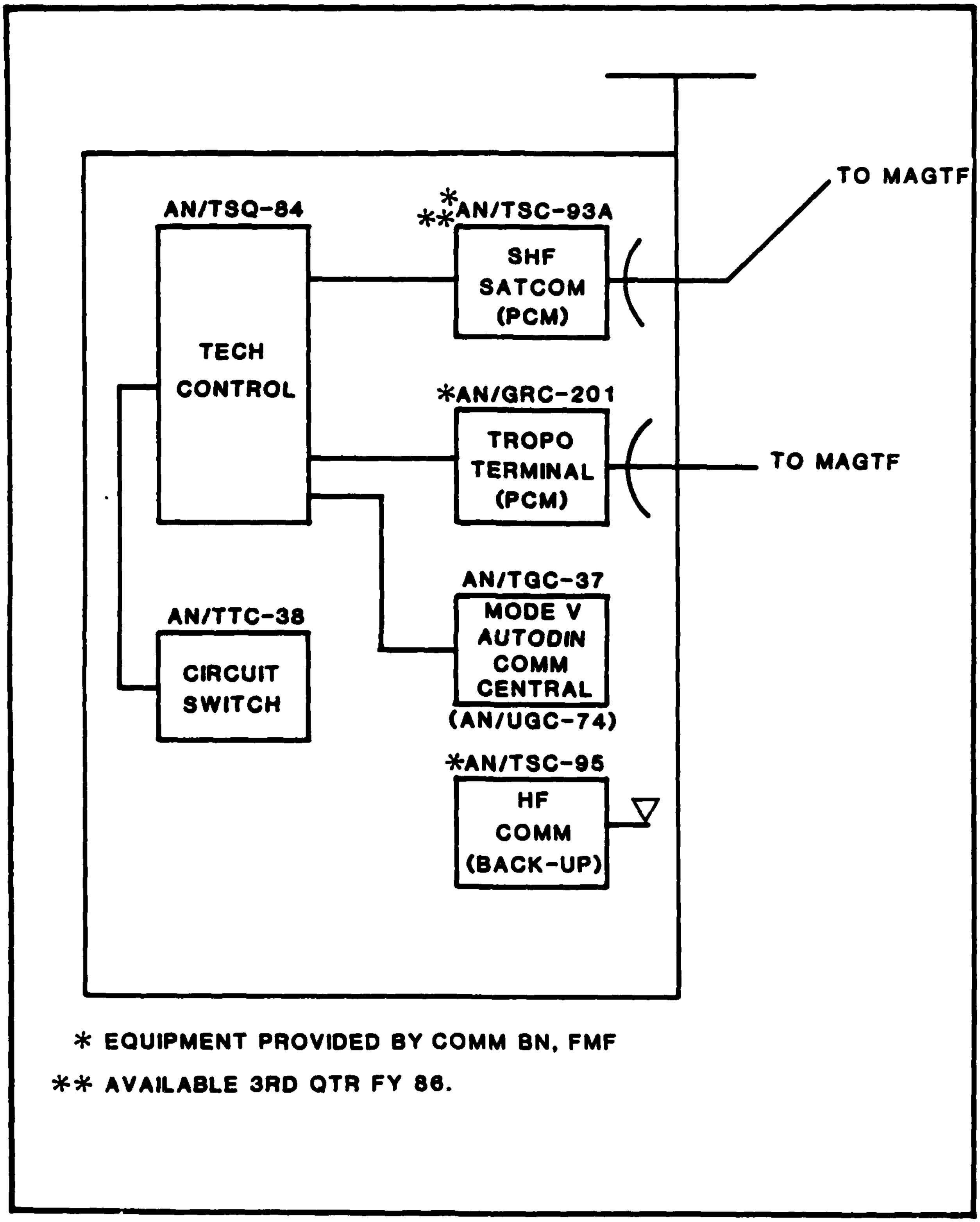

Figure 5-2. DIV NODE 1985

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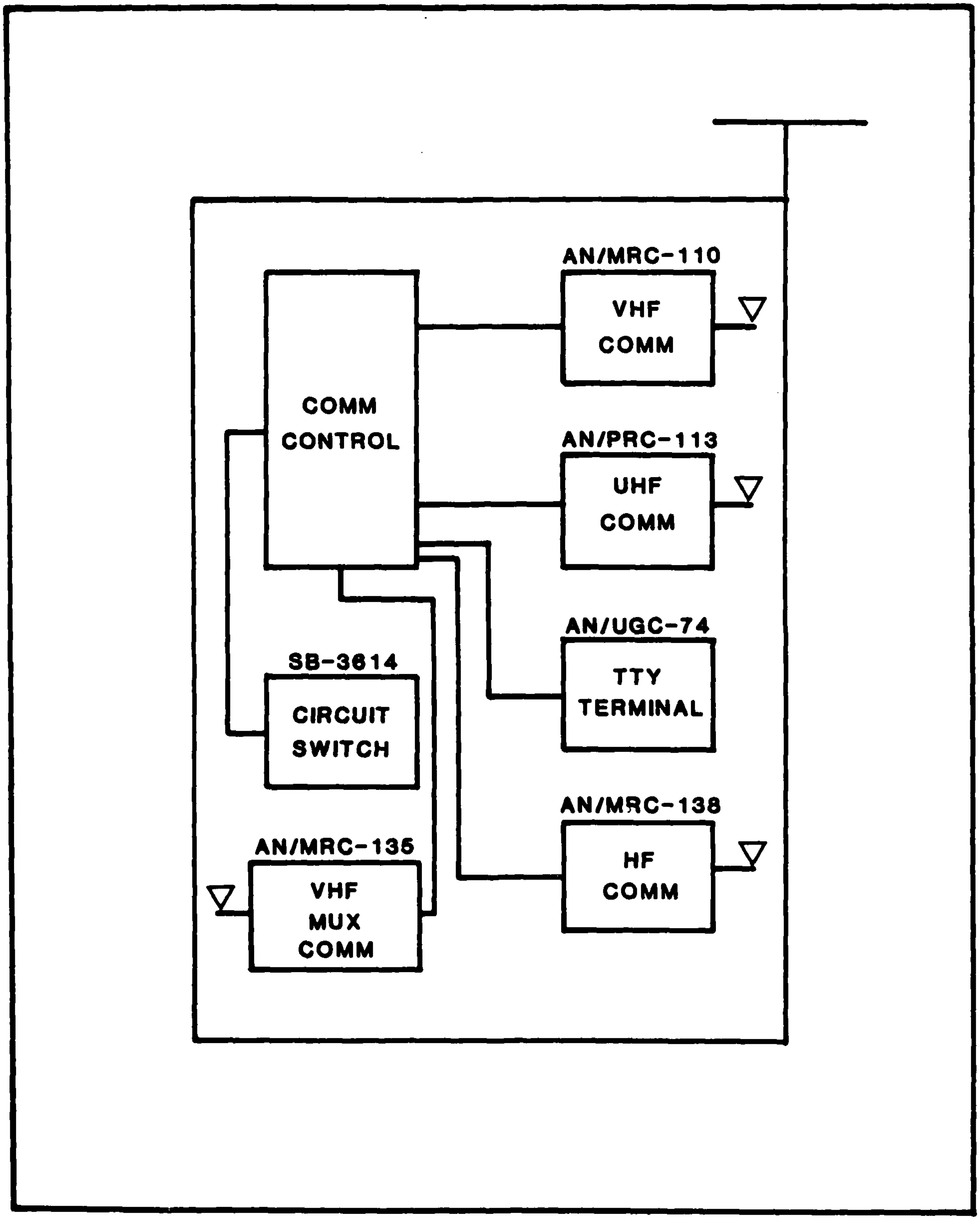

Figure 5-3. RLT (REGT) NODE 1985

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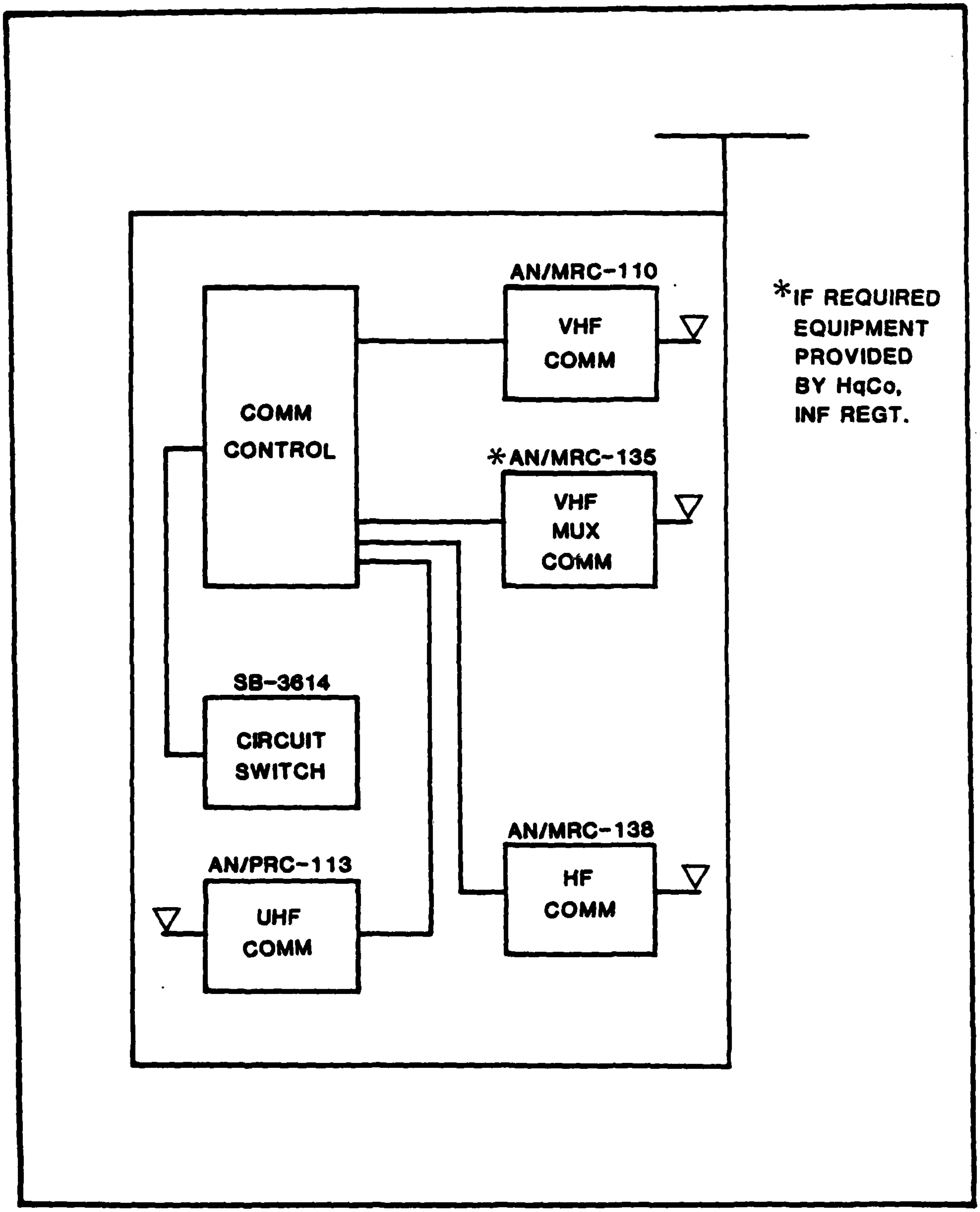

Figure 5-4. BLT (BN) NODE 1985

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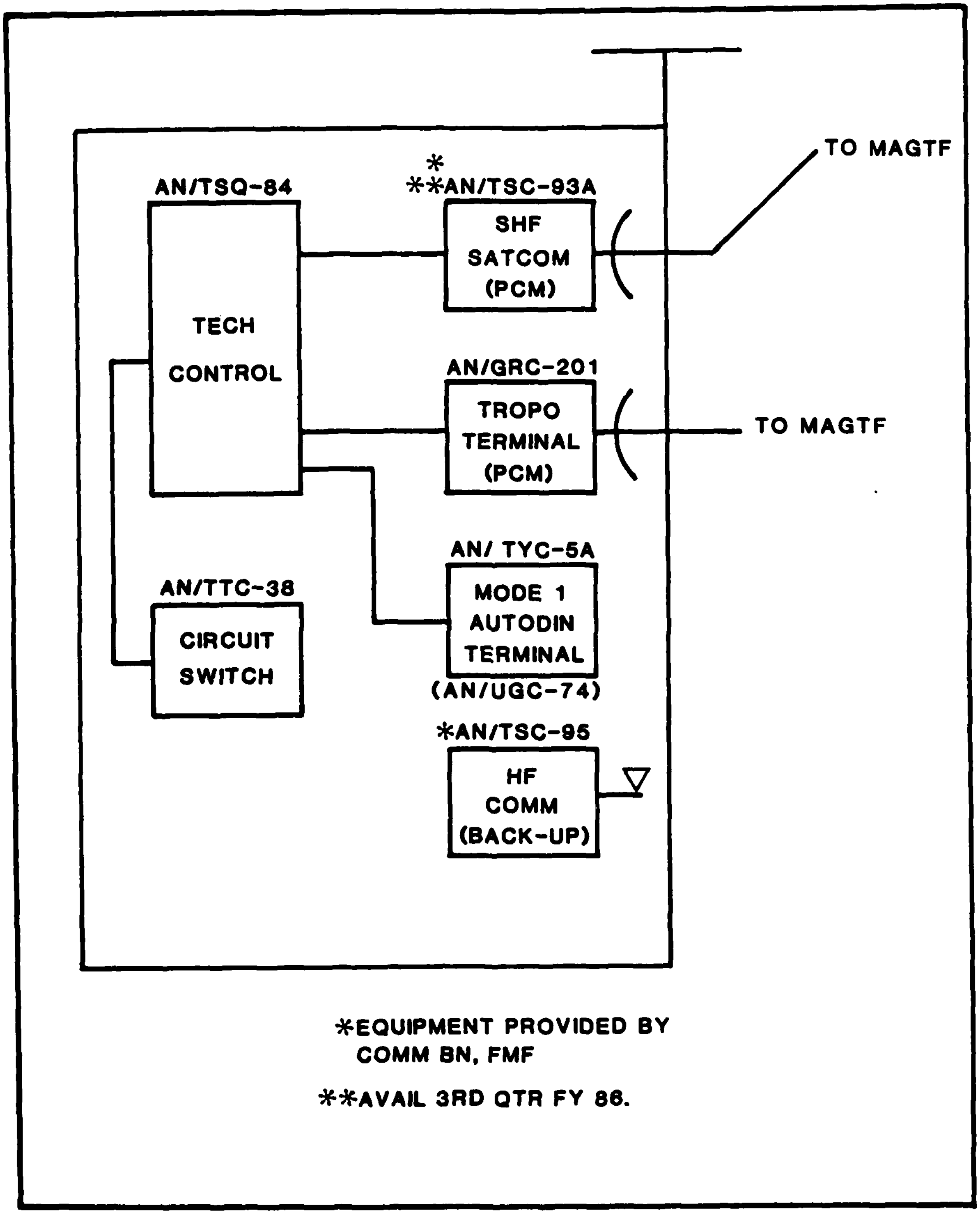

Figure 5-5. MAW NODE 1985

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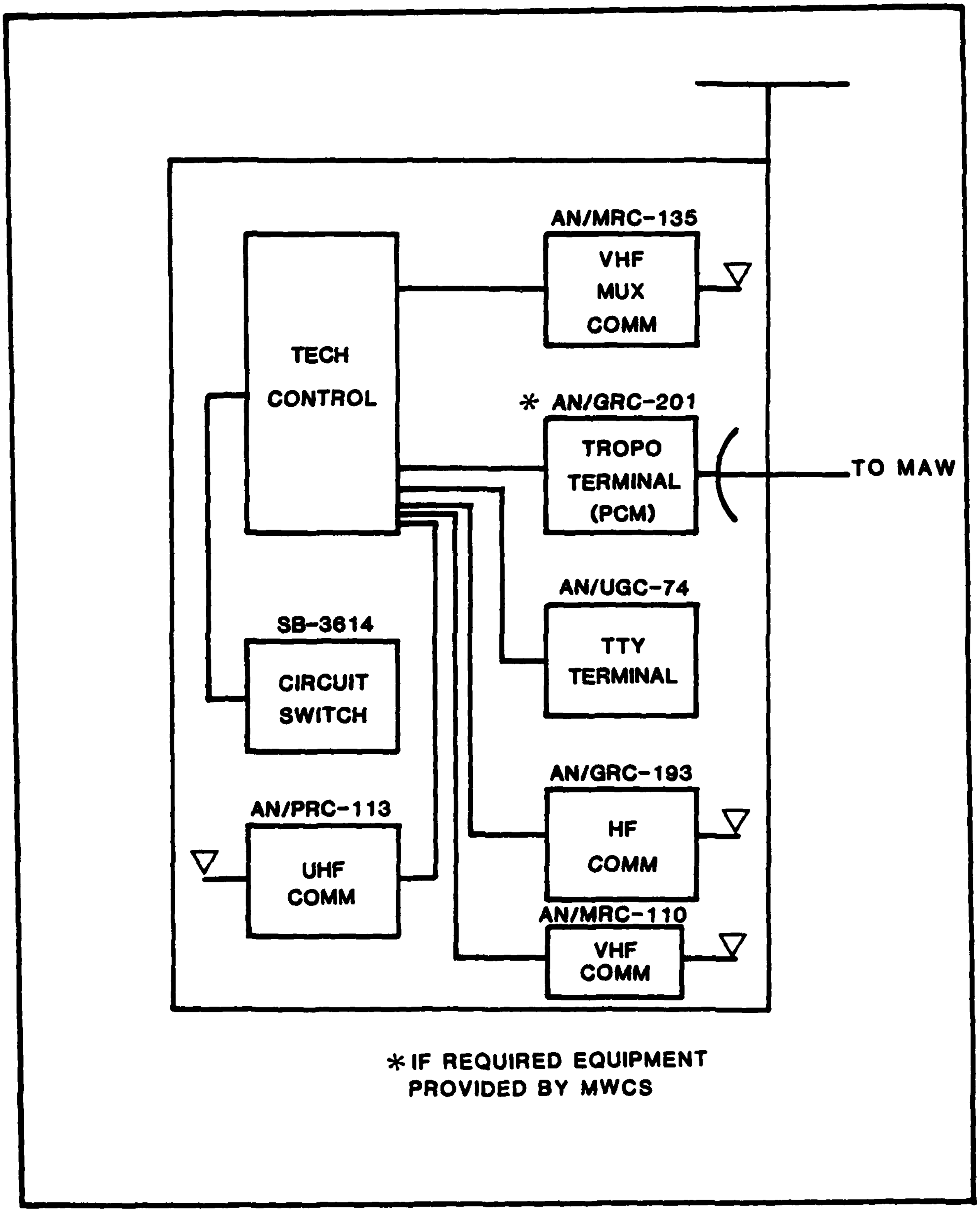

Figure 5-6. MAG NODE 1985

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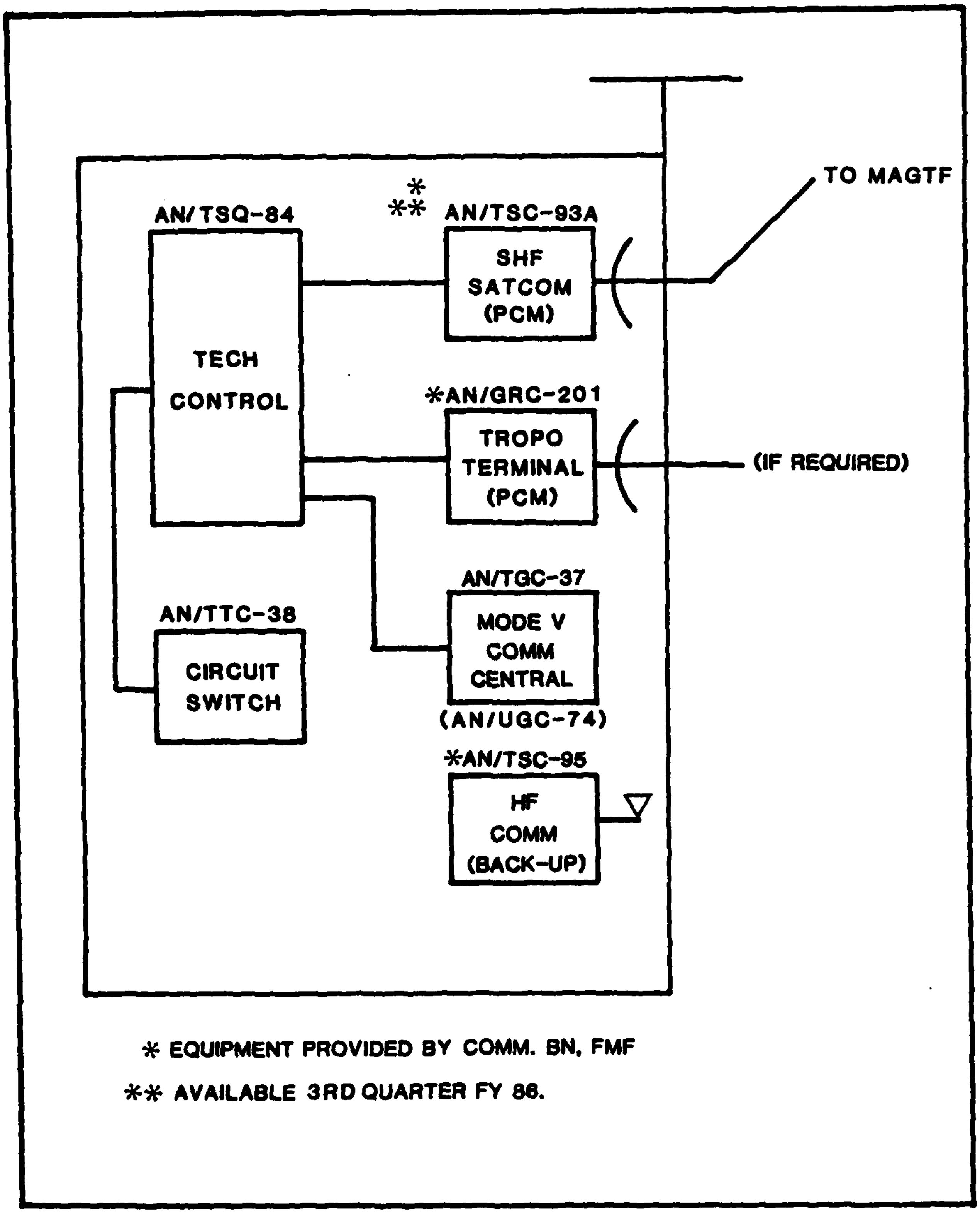

Figure 5-7. FSSG NODE 1985

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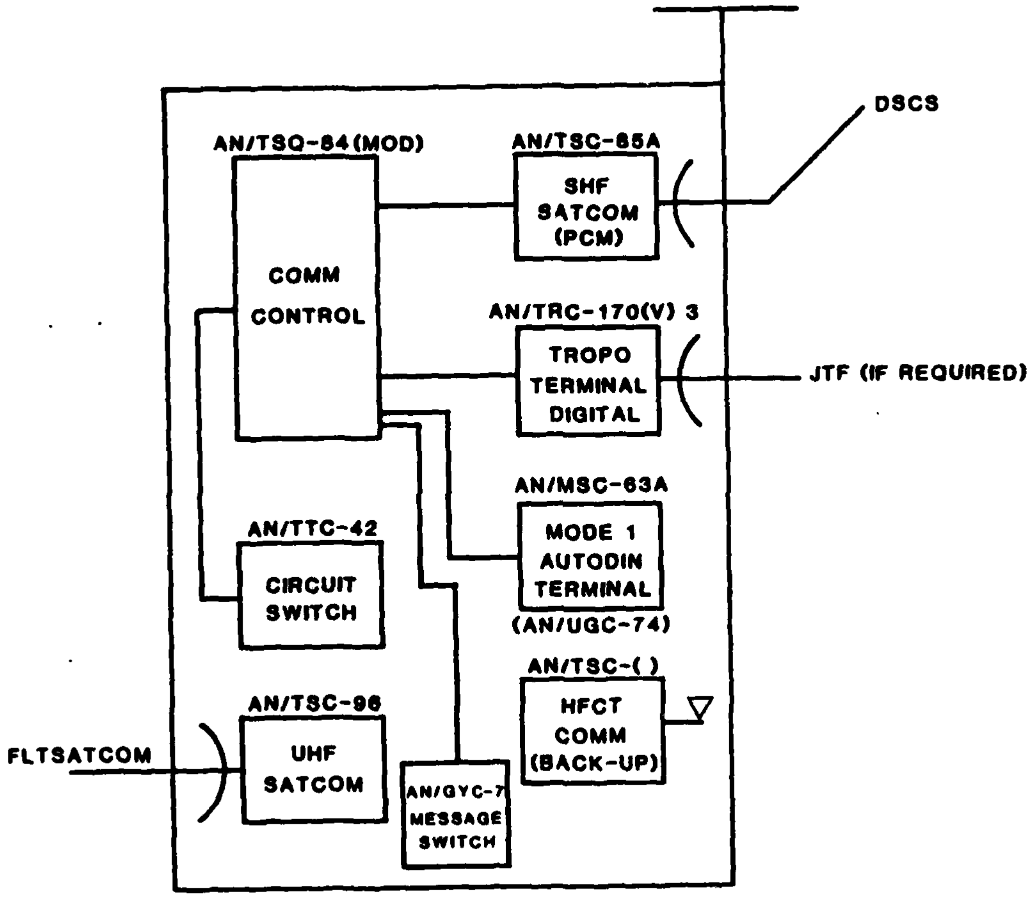

Figure 5-8. MAGTF (MAF) NODE 1991

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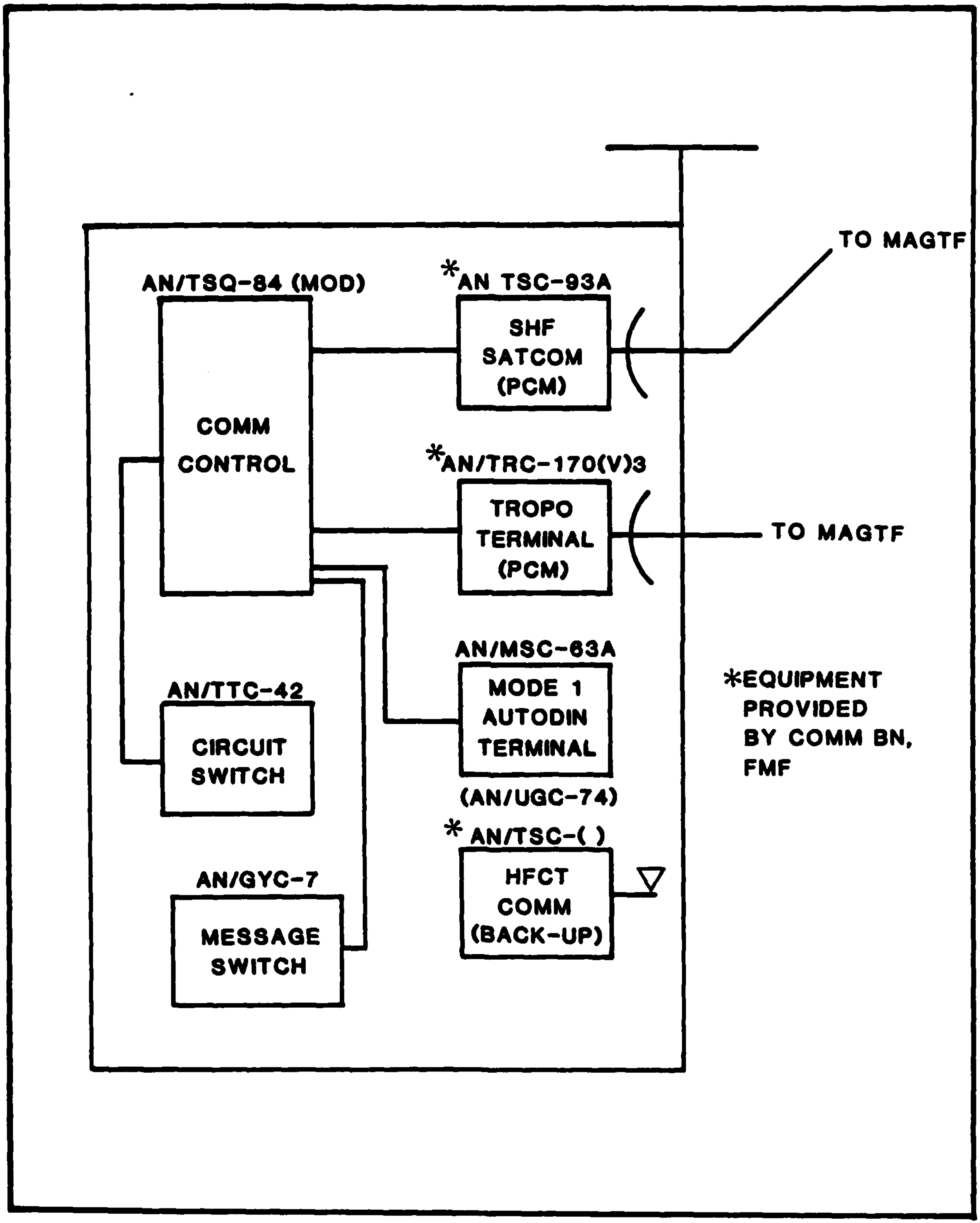

Figure 5-9. DIV NODE 1991

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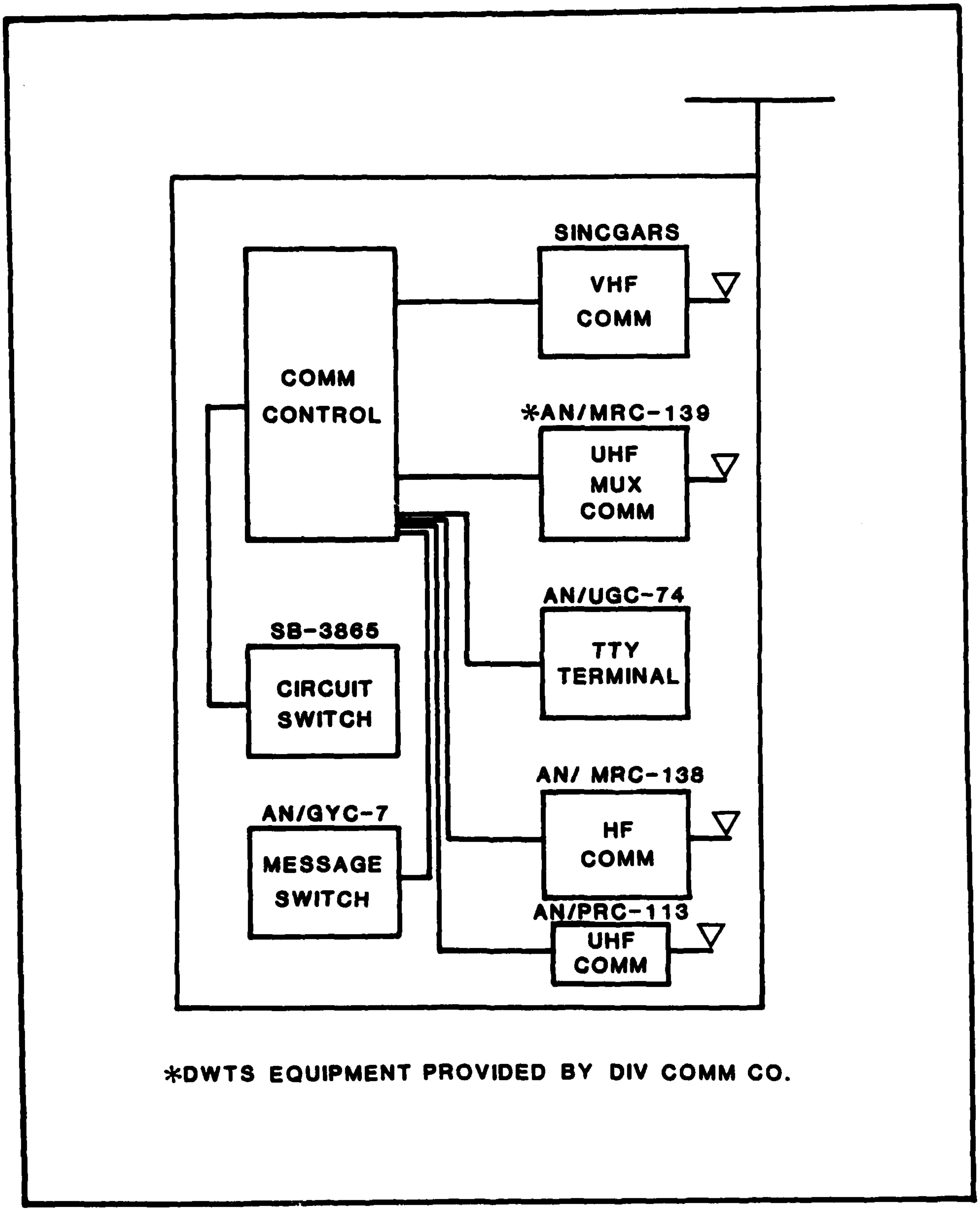

Figure 5-10. RLT (REGT) NODE 1991

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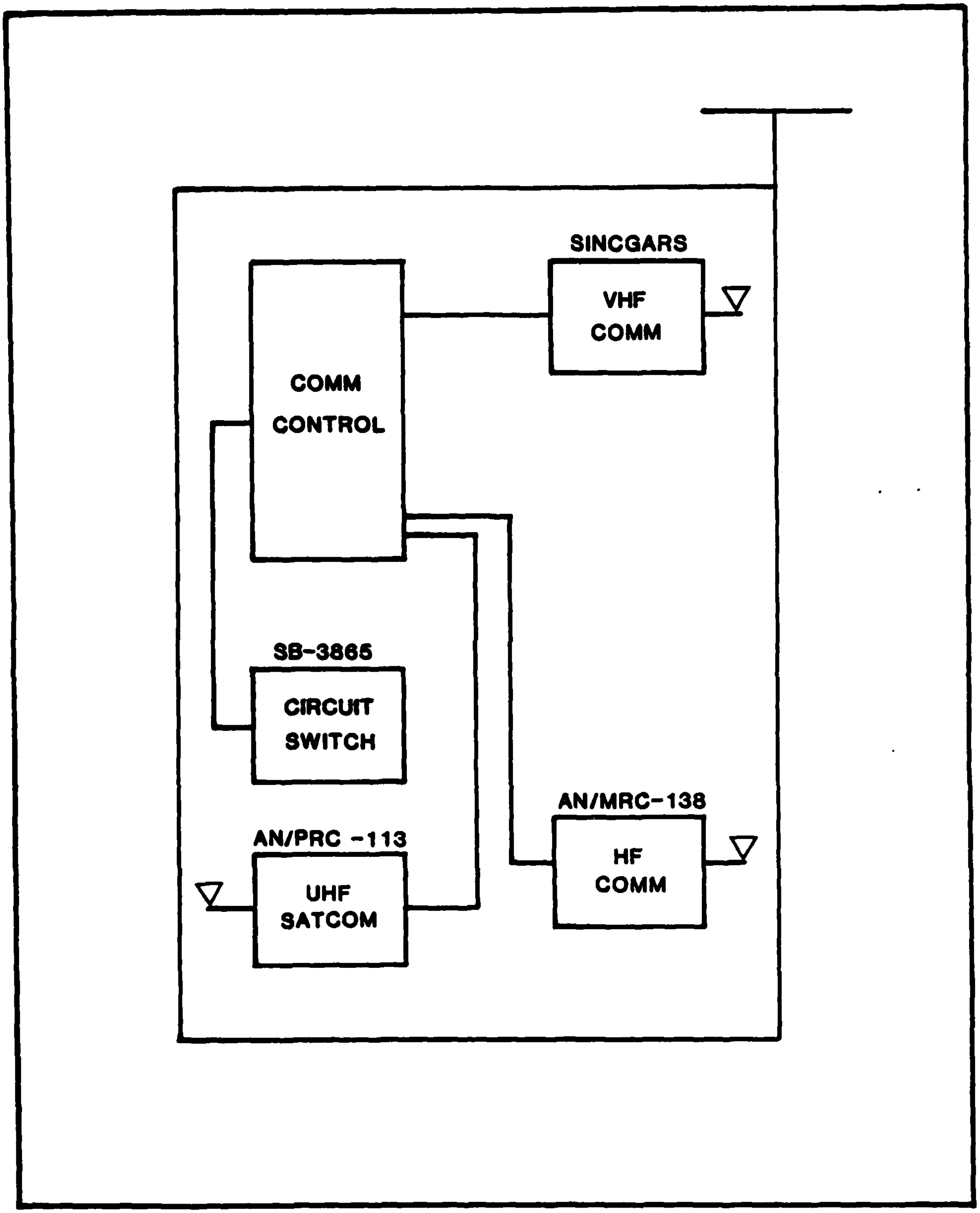

Figure 5-11. BLT (BN) NODE 1991

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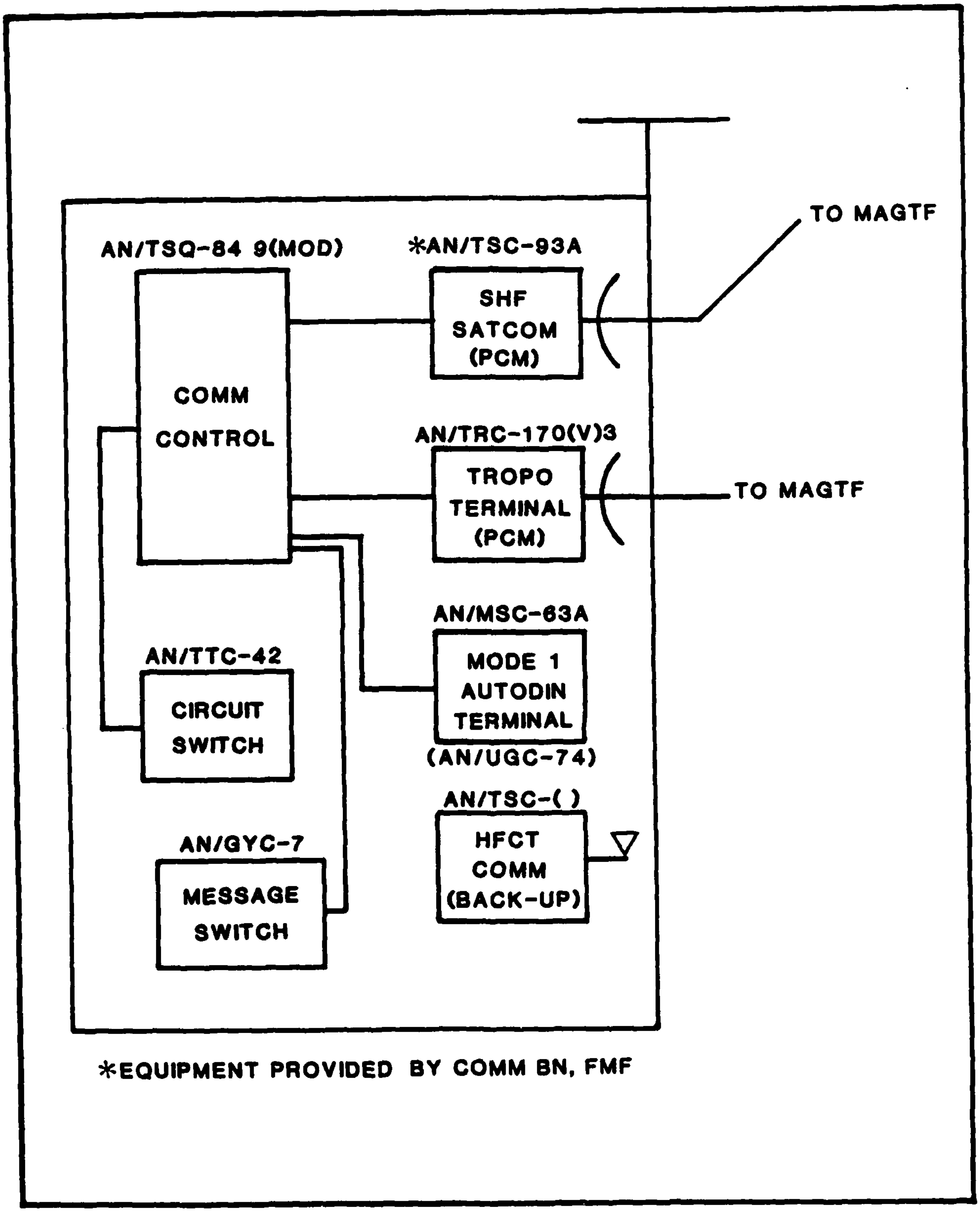

Figure 5-12. MAW NODE 1991

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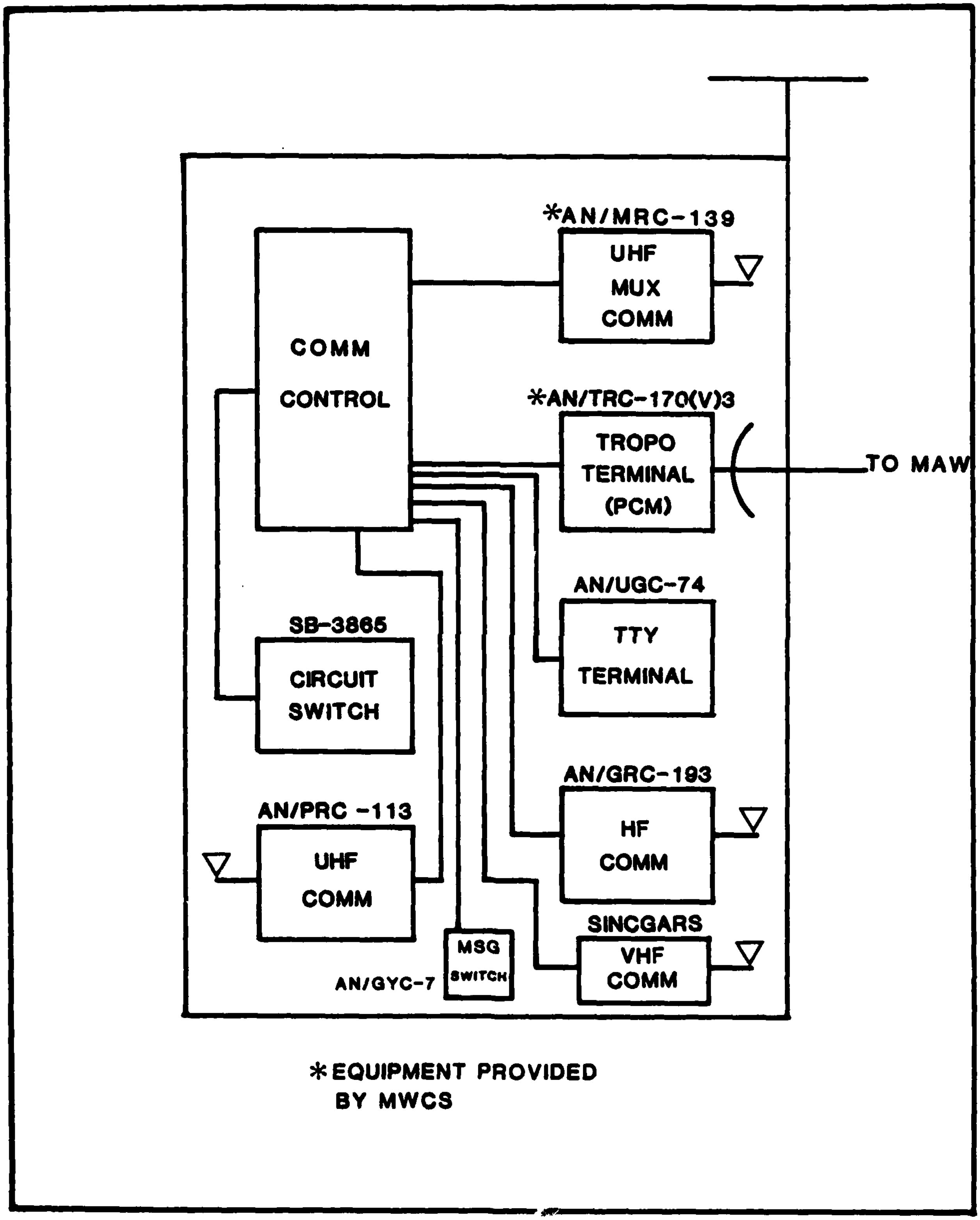

Figure 5-13. MAG NODE 1991

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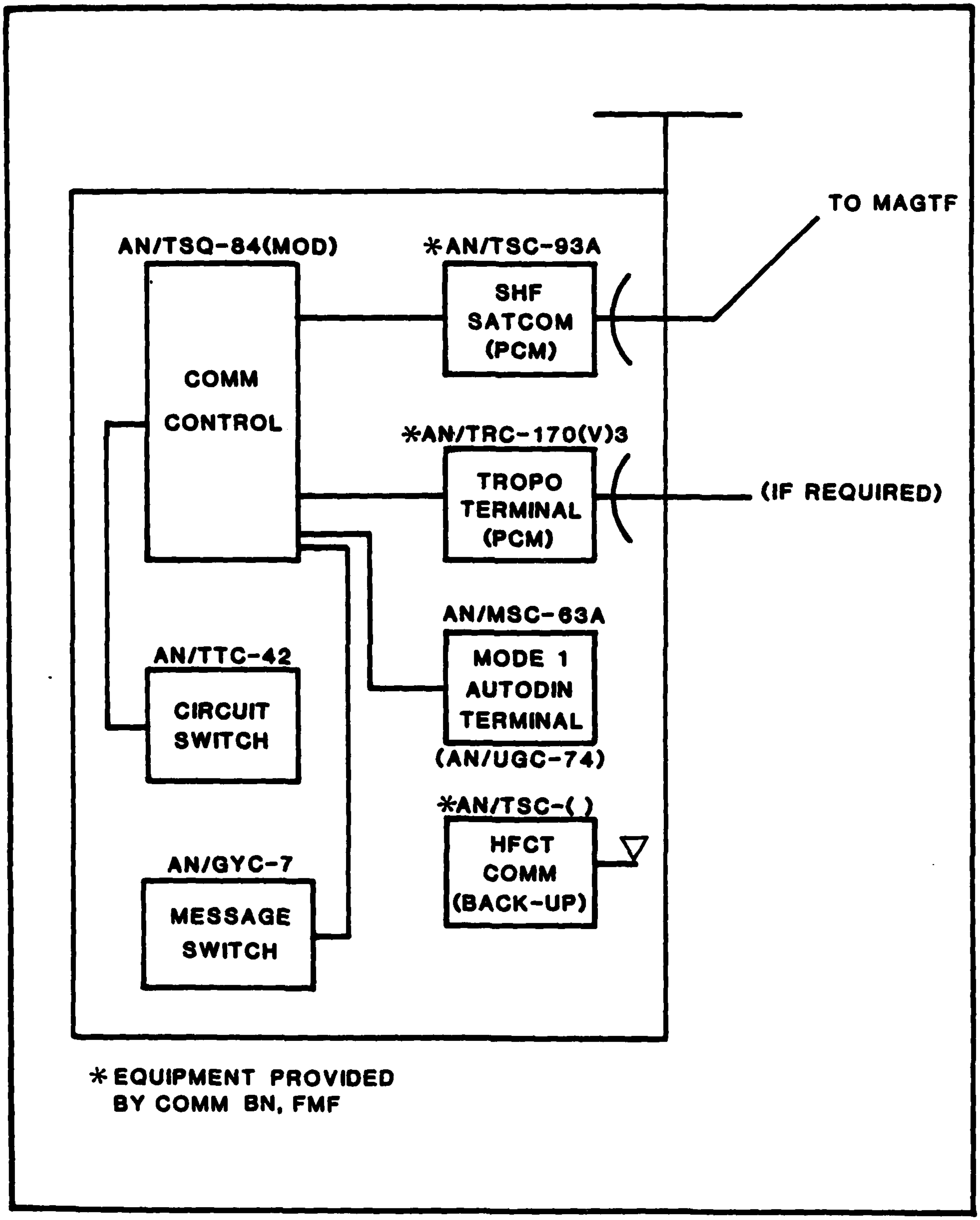

Figure 5-14. FSSG NODE 1991

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SECTION 6. COMMUNICATIONS CONFIGURATIONS

6.1 Introduction

This section deals with the scenario described in section 2 and how communications equipment and systems will be utilized to support the execution of that scenario. The complete network structure, less landlines, is used in order to put AIS requirements into context with the total communications capability. This description is supported by network diagrams and an equipment breakdown by unit provided as table 6-1. That equipment listing reflects C^3 systems in use for 1986 and planned distribution of future communications equipment and tactical data systems. Changing communications configurations for both pre-MTACCS (1986) and MTACCS (1991) eras are shown on the diagrams and explained in the preceding narrative. In addition to changes between pre-MTACCS and MTACCS eras, the types and numbers of circuits vary as the assault and operations ashore progress. In general the post D-Day diagrams are designed to reflect the incremental changes occurring during the period rather than the complete topology. The changing configurations are presented in the following manner using D-Day as an example:

- D-Day (1986)
- External (Including TAE)
- Internal
  - Single Channel
  - Multichannel

TAE capabilities are shown in the external category since the TAE is outside the AOA. This sequence is followed for the D+5 and D+11 periods and then repeated for the 1991 era. In the case of single channel diagrams there are few changes. The single channel topology is not supported by circuit/channel allocations because of the low level of AIS communications in that network.

Multichannel configurations are presented in two formats, toplogy and supporting channel allocation. The convention for numbering figures has been modified in this section to assist in correlation between the figures and supporting channel allocations. The normal convention is to number illustrations sequentially within major sections. In this case they are numbered by subsection. For example, the 1986 D-Day, subsection 6.2, the TAE Multichannel Topology, is figure 6-2.2 and and the supporting channel allocation is made a part of the figure. On the single channel radio diagrams the nodes have been identified by the OPFACs they represent indicating that single channel radio circuits are generally for specific users. In contrast, on the multichannel diagrams, the nodes are identified by the units being served by the multichannel switching system showing that the multichannel system is for all users.

As discussed in section 2, the three phases of the scenario have been labeled D-Day, D+5, and D+11 to coincide with the scenario landing schedule. These three points actually represent periods of time (e.g., D-Day may represent a period of several days depending upon the intensity of combat). Likewise D+5 may represent several days and might not occur until the tenth or twentieth day after D-Day. The third phase D+11 also represents a time period of several days and represents the stage where command shifts to the CLF.

6.2 D-Day, 1986.

As noted above, D-Day refers to the period of time it takes to make the assault and expand the beachhead to the degree that major OPFACS, including the Division CP, are ashore. The following subparagraphs and diagrams describe the evolution of communications during the D-Day period.

Table 6-1. C4 Equipment Allocations

TAM NO.	EQUIPMENT	FOR RECCO 4623	SSCT 4732	COMM BN 4020	RAD BN 4737	HQBN DIV 1021	HQ INT 1121	INF BN 1172	RECON BN 1421	CMBT ENGR 1321	TANK BN 1921	AMPHIB BN 1621	ART HQ 2201	ARTY BN 2209	MAMS 8611	MASG 8740	H&HS 8615	MACS 8612	MASS 8672	MACS 8632	MATCS 8643	LAAMBN 8618	MABS VA 8820	MABS VH 8921	COMM FSSG 3213	MT FSSG 3261	ENGR FSSG 3251	LSBN FSSG 3241	FAAD BTRY 8625	TOPO PLT 4392	LAV BN 1721	ANGLICO 4852	CI TEAM 4722	MED BN 3271
A0010	UYQ-3A																		2															
A0060	TPA-9																		3															
A0080	ADPE-FMF	1		3	1		1	1	1	1	1	1	2	1	11	5	3	1	1	2	1	2	1	1		1	1	1	2		2			1
A0244	TTC-38			1		1												1																
A0246	TTC-38			1																					1									
*A0248	TTC-42			5		2							1				3						1	1	3									
*A0266	MSC-63A		1		3																													
A0268	TGC-37			2	1	2												2							1									
A0284	UGC-74			30	20	16	5		2	2			6			4		16		3			9	3	14		2	2						
A0280	TYA-11																2			2														
A0288	TSC-95			4																														
A0305	TRC-171			4																														
A0311	TSQ-84			2		1												1							1									
A0437	TYC-5A			2														1																
*A0498	PSC-2	62		12	37	77	17	43	134	4	30	30	36	15		10	4	28	10	6	8	15			80						19	9	5	
A0510	UYQ-4A																		1															
A0656	TSC-96			3																														
A0659	GXC-7A			10	4	5	4	2	2	2	2	2	3	2		4	4	8	2	3	4	6	4	4	8			2			2			
A0812	TSC-85A			1																														
A0814	TSC-93A			4																														
*A0817	GPS						4							3					3	1	5	4								6				
*A0882	JTIDS																1		4	2														
*A0915	MIFASS					1																												
*A0917	PSC-3			16																														
*A1111	TSQ-122																		1															
*A1229	PLRS					3																												

*PLANNED FUTURE EQUIPMENT (See Appendix D, page 10 for nomenclature)

Table 6-1. C4 Equipment Allocations (Continued)

TAM NO.	EQUIPMENT	FOR RECCO 4623	SSCT 4732	COMM BN 4020	RAD BN 4737	HQBN DIV 1021	HQ IRT 1121	INF BN 1172	RECON BN 1421	CMBT ENGR 1321	TANK BN 1521	AMPHIB BN 1621	ART HQ 2201	ARTY BN 2209	MWHS 3611	MWSG 8740	H&HS 3615	MWCS 8612	MASS 8672	MACS 3632	MATCS 8643	LAAMBN 3618	MABS VA 9820	MABS VH 8921	COMM FSSG 3213	MT FSSG 3261	ENGR FSSG 3251	LSBN FSSG 3241	FAAD BTRY 8625	TOPO PLT 4392	LAV BN 1721	ANGLICO 4852	CI TEAM 4722	MED BN 3271
*A1650	OE-334																1		2	1														
A1795	GRC-193															3		10	10	7			2	2										
A1815	GRC-160			3		13	45	11	16	7	3	2	3	6		2		6	6			5	2	2	15	10	4	6			20			32
A1825	GRC-201			8														14																
A1930	MRC-110			7	10	16	3	2	2	5	3	2	5	2		1			5	1			2	6	14	5	9	4			3			
A1935	MRC-138	1		30	14	17	4	3	4		3	2	7	5				2	3			3		4	8	4	9	3	1		3			2
*A1955	MRC-139			24		20												26				12			12									
A2050	PRC-77	26		30	48	48	11	58	78	43	9	5	30	39		7		26	8	8		20	25	29	70	10	29	35	90		19			7
A2065	PRC-104	12		15	6	16	5	5	26	4	1	5	7	8				8	8	8		20		8	19	3	3	14	23		10	64	3	8
*A2069	PRC-113	15		8	4	1	6	9	28		1	3	2					2	3			4	5	6	5			4			15	17		
A2150	VRC-47			6		6	1	2				5	1			1		1	2				1	1	12									
*A2179	TRC-170			8														14																
*A2180	SINCGARS	26		30	48	48	10	58	6	43	9	5	30	39		7		26	8	8		5	25	25	70	10	29	35	90			78	8	7
A2181	GRC-171A																14		38	20														
A2183	MRC-135			22		20	8						14					10		2		9	2	2	13			2						
*A2189	SRVR			3		13	3	11		7	3		3	6		2		6				5	2	2	13	10	4	6				21	5	32
*A2190	LRVR			29	52	52	10		4	8	7	12	21	42		3		25	4			14	15	14	46	5	14	12						
A2480	SB-22			4	3	9	5	3		3	1	1	3	3				2	1			3			8	3	4	6	1		2			13
A2500	SB-3082			2												1		5		1		1	1	1	2			3						
A2505	SB-3614			12	1	7	3	1	1	1	1	1	3	1		2		2	1	1		2	2	2	6			3						
*A2506	GYC-7			1		3	2						3	1		1		2		1		1	2	2	2									
*A2508	SB-3865			15		6	3	2	1	1	1	1	2	2		2		6	2	2		2	2	2	6			2						
*A2525	TAOC-85																2			4														
*A2534	TCO					1																												
A2645	TGC-46			4																														
A2682	TCC-72			8															14															
*A3260	VSC-7			3																														

*PLANNED FUTURE EQUIPMENT (See Appendix D, page 10 for nomenclature)

6.2.1 External Communications D-Day, 1986. During the movement to the objective area external communications will have been provided by the CATF. This will generally continue throughout the D-Day period or until the TSC-93 and TSC-96 satellite communications and the TSC-95 HF terminals are installed ashore. When these facilities became operational the capability exists for communications into the national systems either directly or via the TAE, CATF, or a Naval Communications Station.

Internal communications within the TAE will be established prior to D-Day. Multichannel radio using the AN/MRC-135 for medium range communications and the AN/GRC-201 for extended ranges between dispersed airfields will be the primary means of communications. Single channel radio will provide an alternative system (see figures 6-2.1 and 6-2.2).

External links will be established via the AN/TSC-96 and AN/TSC-95 initially for entry into the national systems. HF single channel radio will establish links to the MAF and TACC(N) afloat. AIS data will be via the national systems during this stage of the operation. Aviation AIS systems will transmit back to outside agencies and non-aviation systems will submit their data via autodin to the DFASC aboard ship as described in section 4. Once the AN/TSC-93A is established by Division ashore it will provide an alternate route to MAF and national systems (figure 6-2.2 refers). The channel allocations for the AN/TSC-93A are broken out in figure 6-2.4.

6.2.2 Internal AOA Communications D-Day, 1986. The following subparagraph discuss the development of single channel and multichannel communications in the AOA.

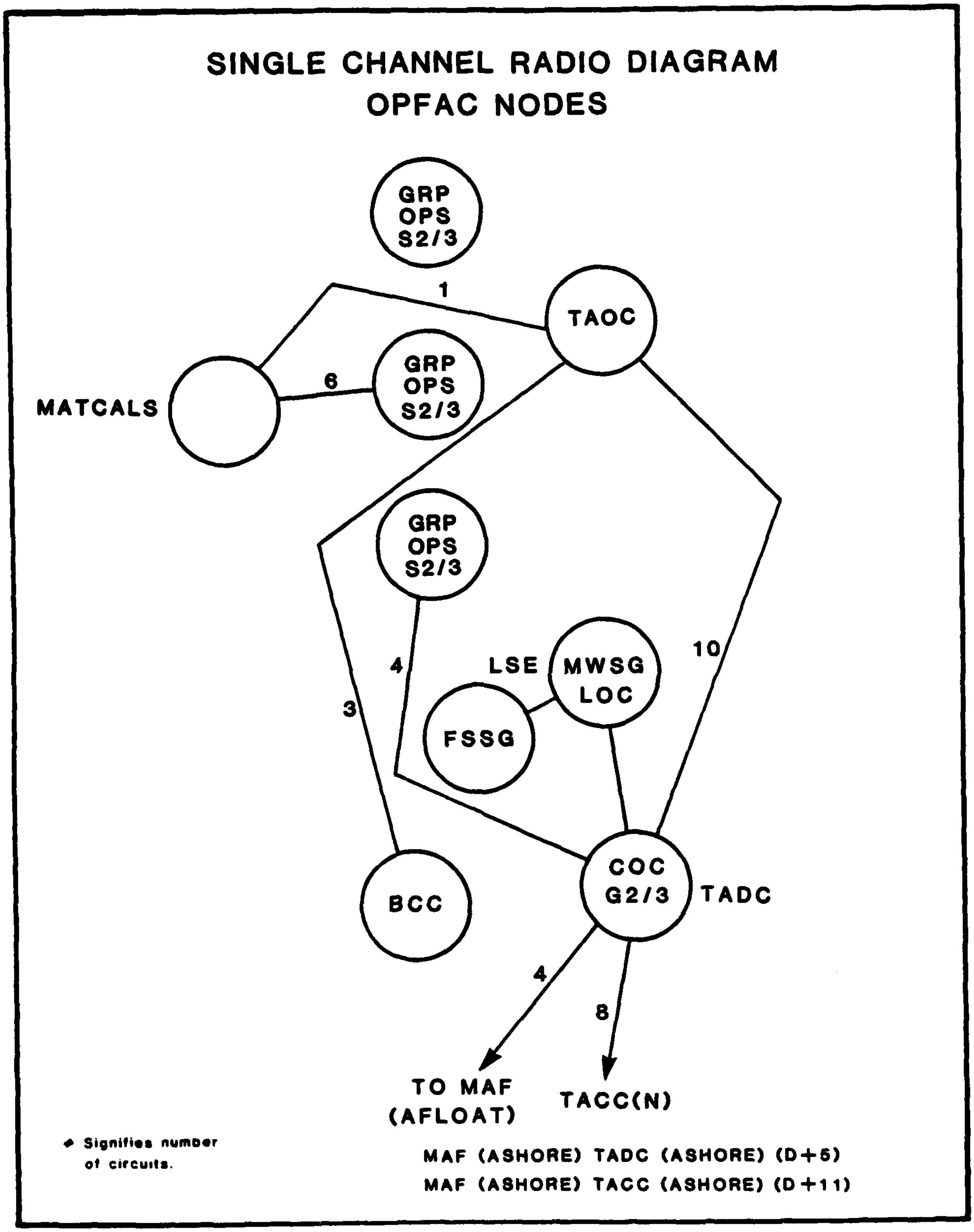

Figure 6-2.1. Single Channel Radio TAE D-Day to D+11 (1986-1991)

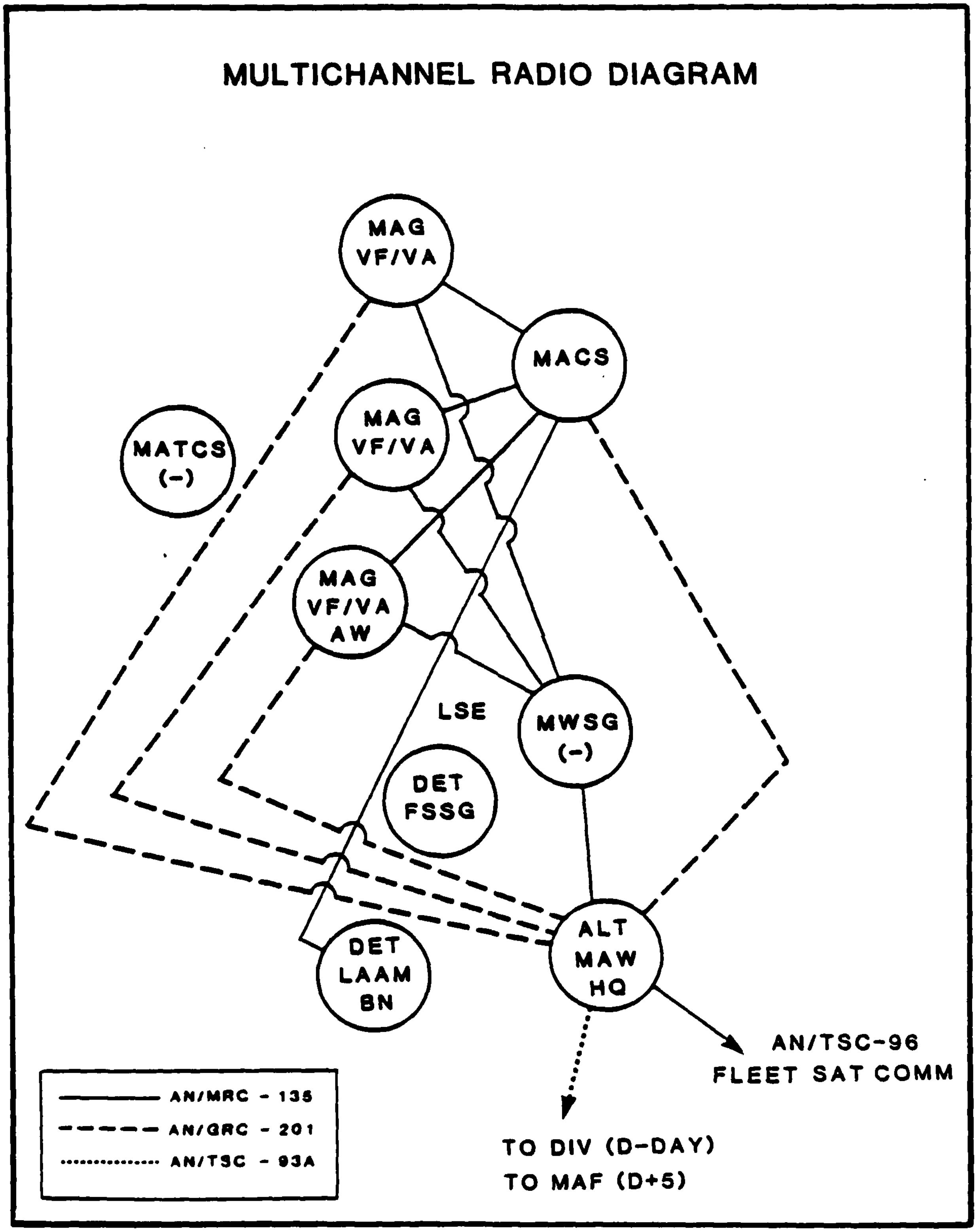

Figure 6-2.2. Multichannel Radio TAE D-Day to D+11 (1986)

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FIGURE 6-2.2 MULTICHANNEL RADIO ALLOCATION (CONTINUED)
TAE D-DAY THRU D+11 1986

SOURCE	SINK	EQUIP	CHAN
ALT MAW HQ	MWSG	MRC-135	8

1 TECHCON - TECHCON
2 G4 - S4
3 100 WPM TTY, H/DUX (COMM. CEN)
4 CU 2W/20 Hz TRUNK
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
ALT MAW HQ	MAG	GRC-201	24

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 TADC - OPS
4 TADC - OPS
5 G3 - S3
6 G2 - S2
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK
9 CU 2W/20 Hz TRUNK
10 CU 2W/20 Hz TRUNK
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK
13 CU 2W/20 Hz TRUNK
14 CU 2W/20 Hz TRUNK
15 CU 2W/20 Hz TRUNK
16 CU 2W/20 Hz TRUNK
17 CU 2W/20 Hz TRUNK
18 CU 2W/20 Hz TRUNK
19 CU 2W/20 Hz TRUNK
20 CU 2W/20 Hz TRUNK
21 CU 2W/20 Hz TRUNK
22 CU 2W/20 Hz TRUNK
23 CU 2W/20 Hz TRUNK
24 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
ALT MAW HQ	EXT	TSC-96	3

1 CUDIX
2 100 WPM H/DUX TTY (COMM. CEN)
3 SECURE VOICE

SOURCE	SINK	EQUIP	CHAN
MAG	MWSG	MRC-135	8

1 TECHCON - TECHCON
2 S4 - S4
3 100 WPM TTY, H/DUX (COMM. CEN)
4 CU 2W/20 Hz TRUNK
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
ALT MAW HQ	MACS	GRC-201	24

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 TADC - TAOC
4 TADC - TAOC
5 TADC - TAOC (ICDL)
6 G3 - S3
7 G2 - S2
8 TADC - AAWC
9 CU 2W/20 Hz TRUNK
10 CU 2W/20 Hz TRUNK
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK
13 CU 2W/20 Hz TRUNK
14 CU 2W/20 Hz TRUNK
15 CU 2W/20 Hz TRUNK
16 CU 2W/20 Hz TRUNK
17 CU 2W/20 Hz TRUNK
18 CU 2W/20 Hz TRUNK
19 CU 2W/20 Hz TRUNK
20 CU 2W/20 Hz TRUNK
21 CU 2W/20 Hz TRUNK
22 CU 2W/20 Hz TRUNK
23 CU 2W/20 Hz TRUNK
24 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAG	MACS	MRC-135	8

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 OPS - TAOC
4 OPS - TAOC
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 HZ TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MACS	LAAMBN	MRC-135	8

1 TECHCON - TECHCON
2 TAOC - BCC
3 TAOC - BCC
4 CU 2W/20 Hz TRUNK
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

6.2.2.1 Single Channel Communications D-Day, 1986. On D-Day primary communications will be via single channel radio. AIS traffic will be held to a minimum during this period. Casualty information and emergency resupply will be by priority voice traffic over the single channel system. The DCT could be used for rapid transmission of standardized messages if planned for in advance (figure 6-2.3).

6.2.2.2 Multichannel Communications D-Day, 1986. As division and regimental headquarters are established ashore a multichannel system will be established. Figure 6-2.4 represents the multichannel system that will be established as the combat situation allows. There is no doctrinally dictated channel allocation scheme. The allocation of channels as proposed in the allocation chart to figure 6-2.4 is based on recent operations plans and known and anticipated command and control requirements.

6.3 D+5, 1986

This paragraph refers to the period of time during which the MAF headquarters is established ashore and command and control will be transitioning from CATF to CLF.

6.3.1 External Communications D+5, 1986. External communications requirements will increase in quantity as discussed in section 7. MAF will establish an AN/TSC-85A link with the AN/TSC-93As at Division, Wing and the TAE. The Division AN/TSC-96 and AN/TSC-95 links established on D-Day will now be assumed by MAF. The CATF and CLF will maintain a AN/VCC-2 link, distance permitting, in addition to the single channel radio circuits. External communications from the TAE remain the same as on D-Day. The only differences are where the circuits terminate as shown in figure 6-2.1 and 6-2.2.

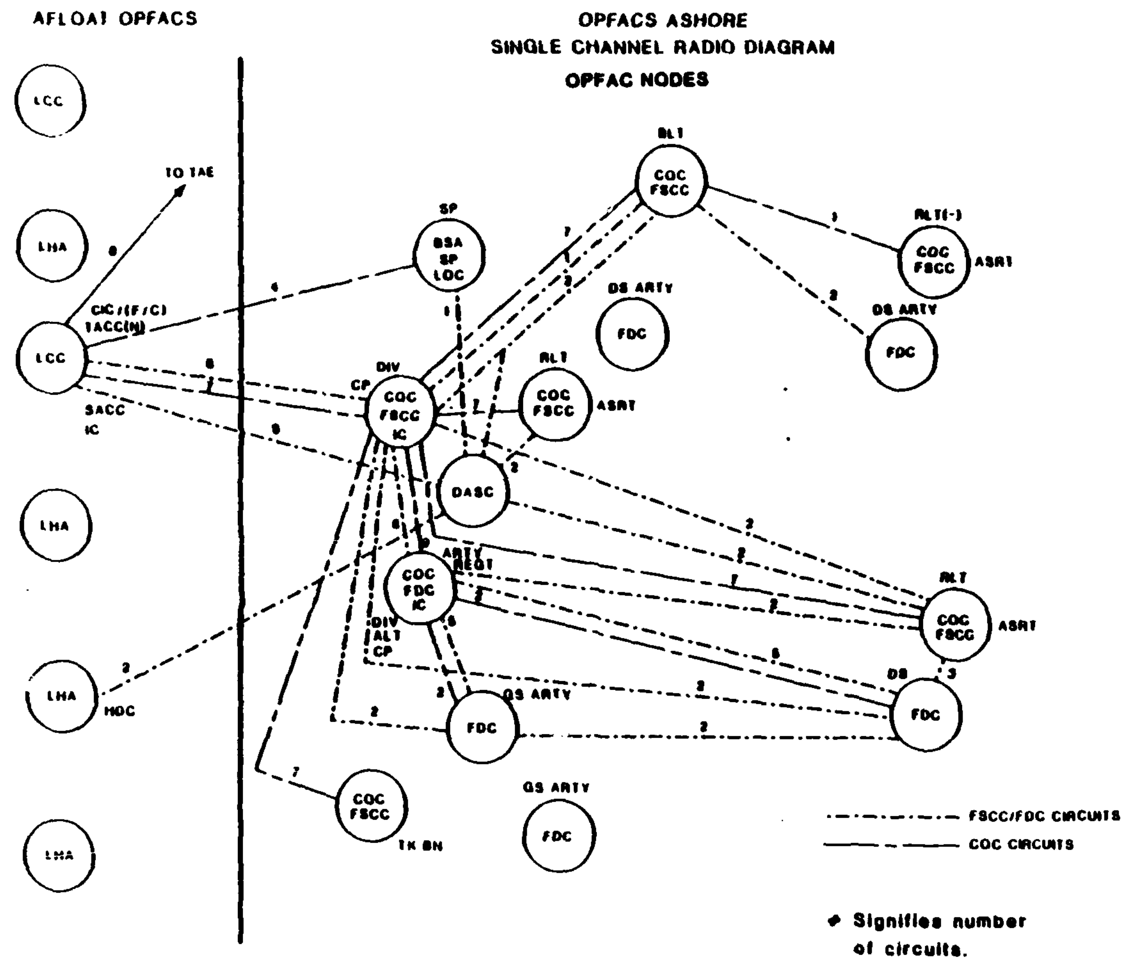

Figure 6-2.3. Single Channel Radio AOA D-Day (1986-1991)

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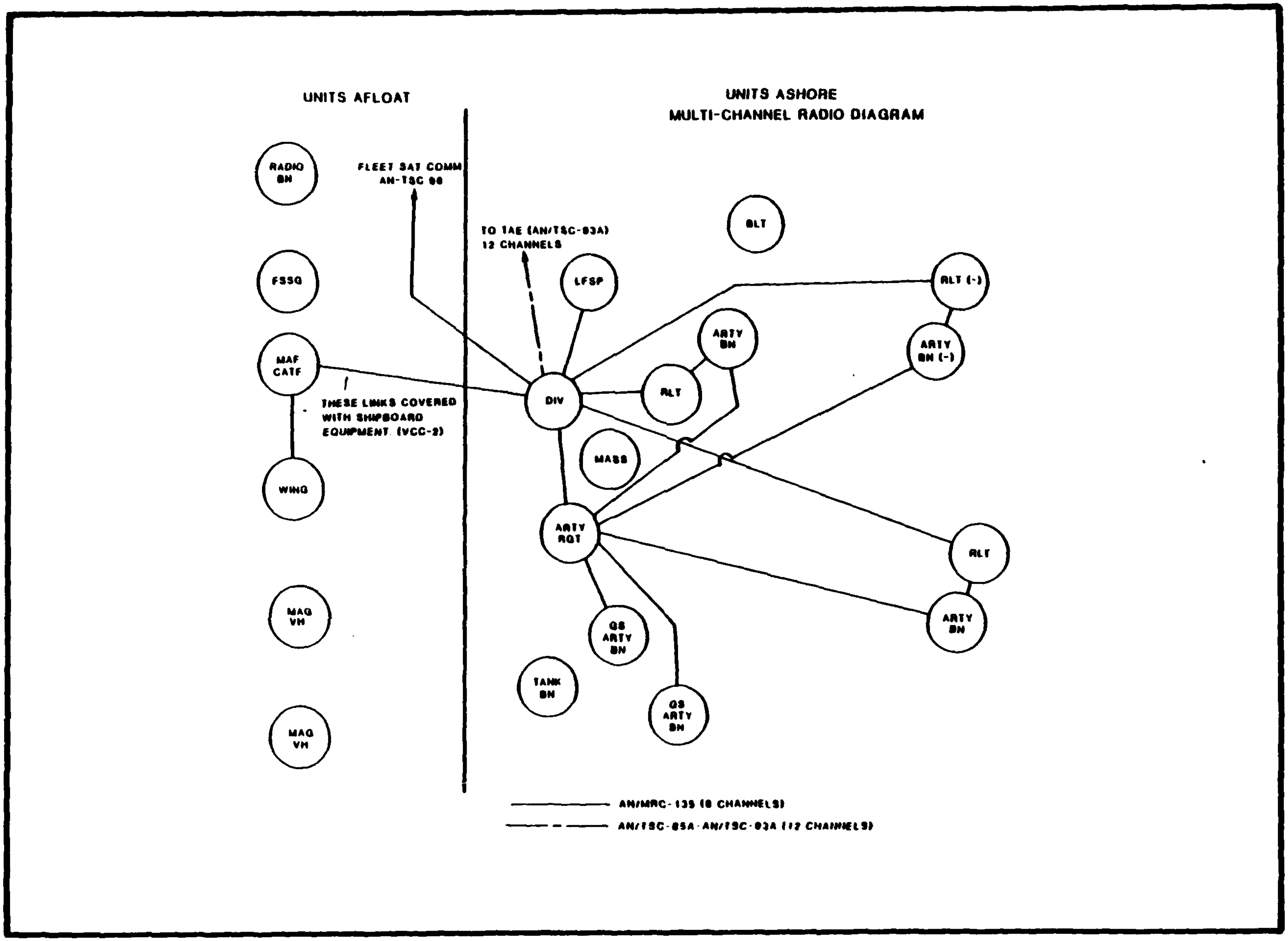

Figure 6-2.4. Multichannel Radio AOA D-Day (1986)

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FIGURE 6-2.4 MULTICHANNEL RADIO ALLOCATION
AOA D-DAY 1986 (CONTINUED)

SOURCE	SINK	EQUIP	CHAN
MAF	DIV	VCC-2	8

1 SYSCON - TECHCON, HOT
2 100 WPM TTY, H/DUX (COMM. CEN)
3 COC - COC, HOT
4 WWMCCS
5 G-2 - G-2, HOT
6 FSC - FSCC, HOT
7 CU 2W/20 Hz TRUNK
8 SI CIRCUIT, HOT

SOURCE	SINK	EQUIP	CHAN
MAF	WING	VCC-2	8

1 SYSCON - TECHCON, HOT
2 100 WP MTTY, H/DUX (COMM. CEN)
3 COC - WING-3, HOT
4 WWMCCS
5 G2 - G2, HOT
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
DIV	EXT	TSC-96	3

1 CUDIX
2 100 WPM TTY, H/DUX
3 SECURE VOICE

SOURCE	SINK	EQUIP	CHAN
DIV	TAE	AN/TSC-93A	12

1 TECHCON - TECHCON, HOT
2 100 WPM TTY, H/DUX (COMM. CEN)
3 COC - TAE TADC, HOT
4 WWMCCS
5 DASC - TAE TADC, HOT
6 FSCC - TAE TADC, HOT

SOURCE	SINK	EQUIP	CHAN
DIV	INF REGT	MRC-135	8

4 G2 - S2, HOT
5 FSCC - FSCC, HOT
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
ARTY REGT	ARTY BN	MRC-135	8

1 COMMCON - COMMCON, HOT
2 FAX
3 FDC - FDC, HOT
4 S2 - S2, HOT
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
DIV	TAE	ANTSC-93A	12

7 SSCT - SSCT, HOT
8 CU, 2W/20 Hz TRUNK
9 CU, 2W/20 Hz TRUNK
10 CU, 2W/20 Hz TRUNK
11 CU, 2W/20 Hz TRUNK
12 CU, 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
DIV	LFSP	MRC-135	8

1 G4 - LFSP, HOT
2 CU 2W/20 Hz TRUNK
3 CU 2W/20 Hz TRUNK
4 CU 2W/20 Hz TRUNK
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
DIV	ARTY REGT	MRC-135	8

1 TECHCON - COMMCON, HOT
2 100 WPM TTY, H/DUX (COMM. CEN)
3 COC - COC, HOT
4 G2 - S2, HOT
5 FSCC - FDC, HOT
6 CU 2W/20 Hz, TRUNK
7 CU 2W/20 Hz, TRUNK
8 CU 2W/20 Hz, TRUNK

SOURCE	SINK	EQUIP	CHAN
DIV	INF REGT	MRC-135	8

1 TECHCON - COMMCON, HOT
2 100 WPM TTY, H/DUX (COMM. CEN)
3 COC - COC, HOT

SOURCE	SINK	EQUIP	CHAN
INF REGT	ARTY BN	MRC-135	8

1 COMMCON - COMMCON, HOT
2 FAX
3 FSCC - FDC, HOT
4 S2 - S2, HOT
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

6.3.2 Internal AOA Communications D+5, 1986. The following subparagraphs discuss the configurations for single and multichannel communication in the AOA during the D+5 period in 1986. As previously mentioned, only the incremental changes from the D-Day period are shown.

6.3.2.1 Single Channel Communications D+5, 1986. Single channel radio will be used mainly for voice operational traffic (figure 6-3.1). Single channel radio will still be the primary means of all communications for front line units. AIS traffic will continue to be passed over this system by front line units. Between major nodes and rear echelons, it will become the backup system to multichannel radio and wire communications.

6.3.2.2 Multichannel Communications D+5, 1986. The multichannel system by D+5 will be expanded as the larger systems from Communications Battalion and Marine Wing Communications Squadron (MWCS) come into play. Figure 6-3.2 reflects the changes in the multichannel system.

6.4 D+11, 1986

D+11 refers to the period of time when the CLF has assumed command ashore, control of fixed wing assets will be under the control of the Wing TACC, and the DFASC is established and operational at FSSG now established ashore. Only incremental changes from D+5 are shown in the figures.

6.4.1 External Communications D+11, 1986. External communications on D+11 remain the same as on D+5. The volume of traffic will be greater and is discussed in section 7.

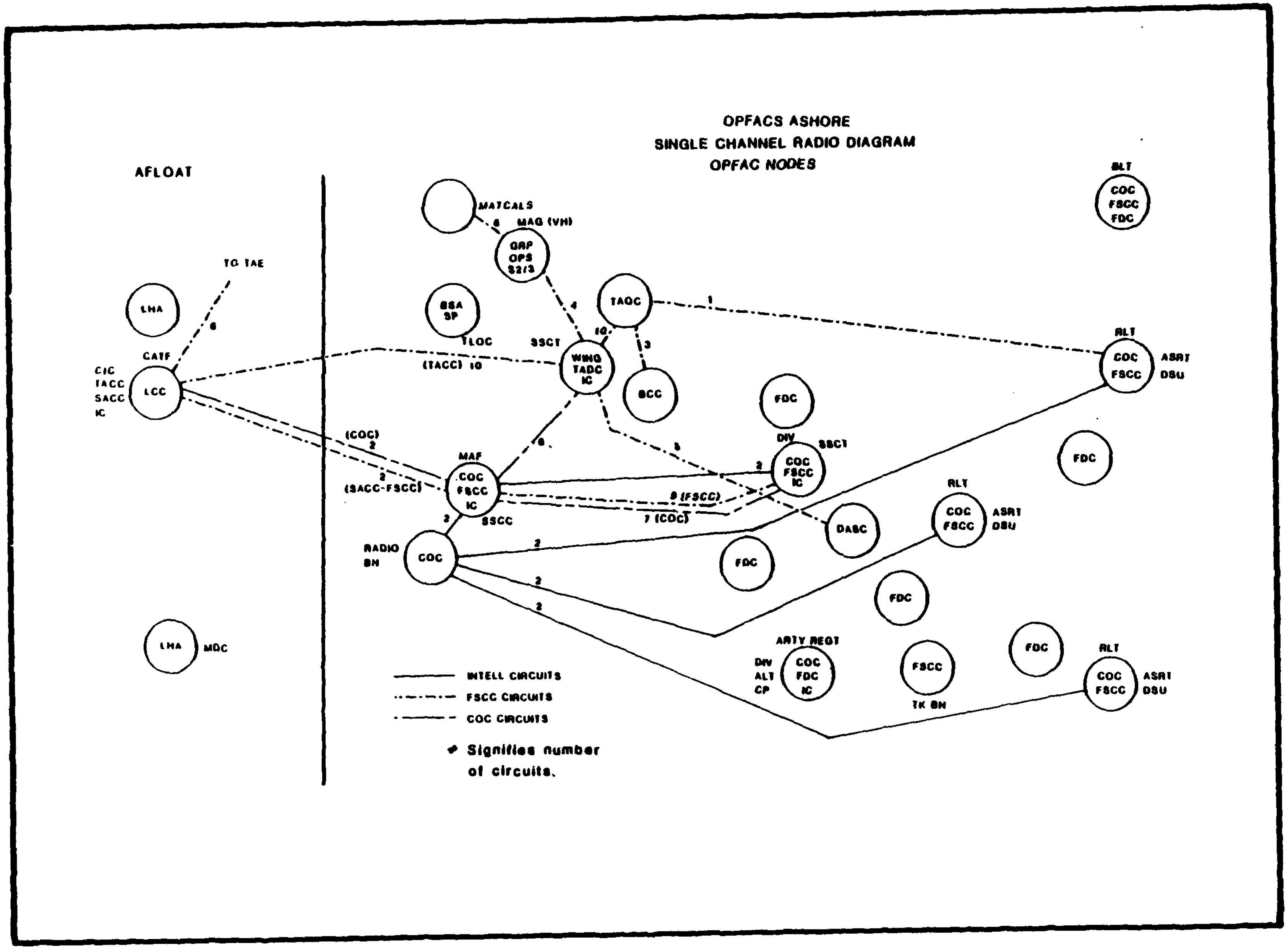

Figure 6-3.1. Single Channel Radio AOA D+5 (1986-1991)

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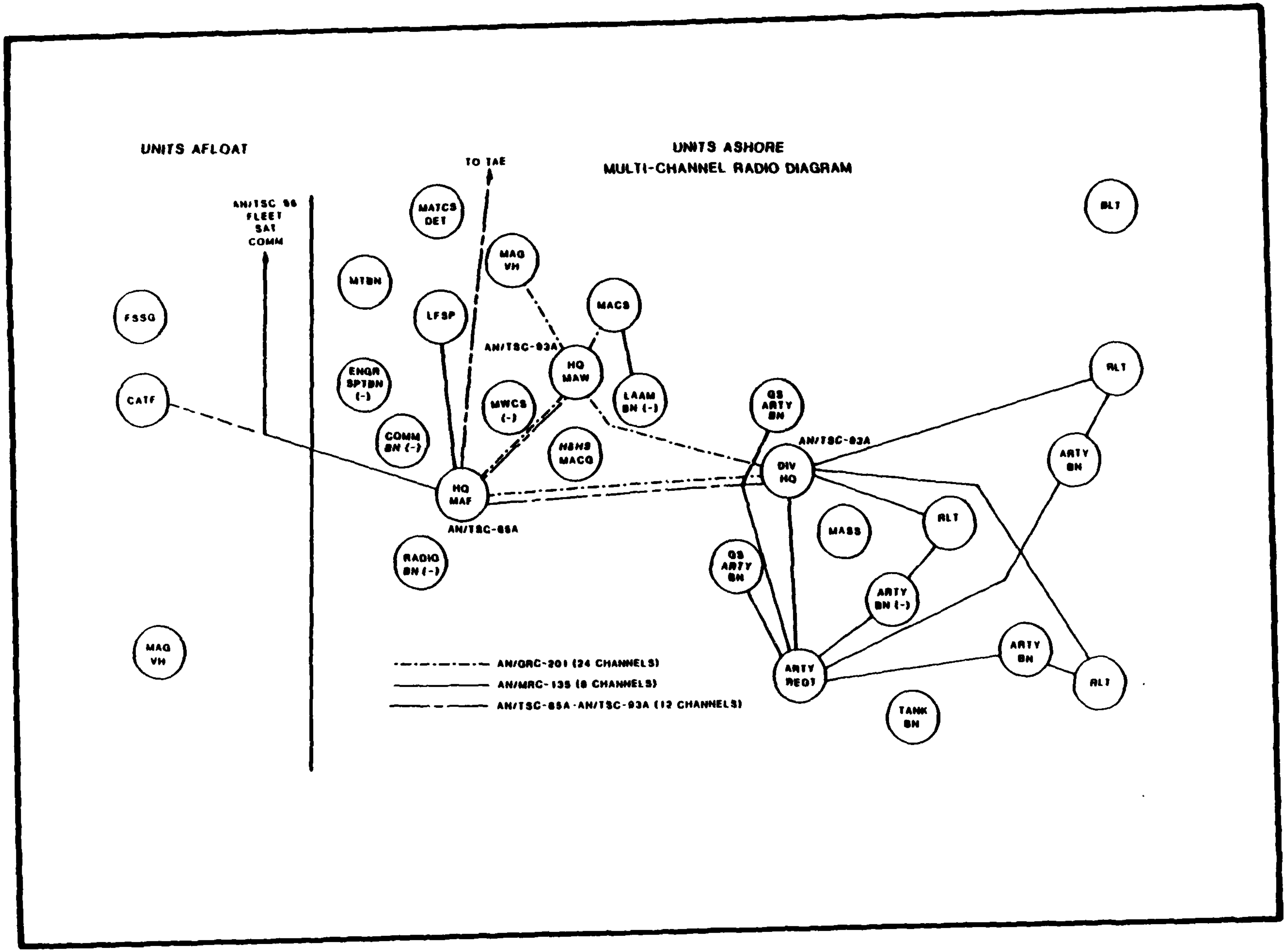

Figure 6-3.2. Multichannel Radio AOA D+5 (1986)

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FIGURE 6-3.2. MULTICHANNEL RADIO ALLOCATION
AOA D+5 1986 (CONTINUED)

SOURCE	SINK	EQUIP	CHAN
CATF	MAF	VCC-2	8

1 TECHCON - SYSCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 SACC - FSCC
4 JIC - G2
5 SSES - SSCC
6 TACC - FSCC
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAF	EXT	TSC-96	3

1 CUDIX
2 100 WPM TTY, H/DUX (COMM. CEN)
3 SECURE VOICE

SOURCE	SINK	EQUIP	CHAN
MAF	TAE	TSC-93A	12

1 TECHCON - TECHCON, HOT
2 100 WPM TTY, H/DUX (COMM. CEN)
3 COC - TAE TADC, HOT
4 WWMCCS
5 DASC - TAE TADC, HOT
6 FSCC - TAE TADC, HOT
7 SSCC - SSCT, HOT
8 CU 2W/20 Hz TRUNK
9 CU 2W/20 Hz TRUNK
10 CU 2W/20 Hz TRUNK
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAF	LFSP	MRC-135	8

1 COMM. COORD.
2 G4 - S4
3 CU 2W/20 Hz TRUNK
4 CU 2W/20 Hz TRUNK
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAF	DIV	GRC-201	24

1 TECHCON - TECHCON, HOT
2 100 WPM TTY, H/DUX (COMM. CEN)
3 FSCC - FSCC, HOT
4 G3 - G3, HOT
5 G2 - G2, HOT (MAGIS)
6 DSU - DSU
7 SSCC - SSCT, BACK-UP
8 FSCC - DASC, HOT
9 FSCC - DASC, HOT
10 G4 - G4, HOT
11 CU 2W/20 Hz TRUNK
12 WWMCCS
13 CU 2W/20 Hz TRUNK
14 CU 2W/20 Hz TRUNK
15 CU 2W/20 Hz TRUNK
16 CU 2W/20 Hz TRUNK
17 CU 2W/20 Hz TRUNK
18 CU 2W/20 Hz TRUNK
19 CU 2W/20 Hz TRUNK
20 CU 2W/20 Hz TRUNK
21 CU 2W/20 Hz TRUNK
22 CU 2W/20 Hz TRUNK
23 CU 2W/20 Hz TRUNK
24 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAF	DIV	TSC-93A	12

1 TECHCON - TECHCON, HOT
2 100 WPM TTY H/DUX (COMM./CEN)
3 COC - COC, HOT
4 WWMCCS
5 DASC - TAE TADC, HOT
6 FSCC - FSCC, HOT
7 SSCC - SSCT, HOT
8 G2 - G2, HOT
9 CU 2W/20 Hz TRUNK
10 CU 2W/20 Hz TRUNK
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK

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FIGURE 6-3.2. MULTICHANNEL RADIO ALLOCATION
AOA D+5 1986 (CONTINUED)

SOURCE	SINK	EQUIP	CHAN
MAF	MAW	GRC-201	24

1 TECHCON - TECHCON, HOT
2 100 WPM TTY, H/DUX (COMM. CEN)
3 FSCC - FSCC, HOT
4 G3 - G3, HOT
5 G2 - G2, HOT (MAGIS)
6 DSU - DSU
7 SSCC - SSCT, BACK-UP
8 FSCC - DASC, HOT
9 FSCC - DASC, HOT
10 G4 - G4, HOT
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK
13 CU 2W/20 Hz TRUNK
14 CU 2W/20 Hz TRUNK
15 CU 2W/20 Hz TRUNK
16 CU 2W/20 Hz TRUNK
17 CU 2W/20 Hz TRUNK
18 CU 2W/20 Hz TRUNK
19 CU 2W/20 Hz TRUNK
20 CU 2W/20 Hz TRUNK
21 CU 2W/20 Hz TRUNK
22 CU 2W/20 Hz TRUNK
23 CU 2W/20 Hz TRUNK
24 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAF	MAW	TSC-93A	12

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 FSCC - TADC
4 G3 - G3
5 G2 - G2
6 SSCC - SSCT
7 DSU - DSU
8 IAC - TERPES
9 IAC - II
10 CU 2W/20 Hz TRUNK
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAW	MACS	GRC-201	24

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 TADC - TAOC
4 TADC - TAOC
5 TADC - TAOC (ICDL)
6 G3 - S3
7 G2 - S2
8 TADC - AAWC
9 CU 2W/20 Hz TRUNK
10 CU 2W/20 Hz TRUNK
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK
13 CU 2W/20 Hz TRUNK
14 CU 2W/20 Hz TRUNK
15 CU 2W/20 Hz TRUNK
16 CU 2W/20 Hz TRUNK
17 CU 2W/20 Hz TRUNK
18 CU 2W/20 Hz TRUNK
19 CU 2W/20 Hz TRUNK
20 CU 2W/20 Hz TRUNK
21 CU 2W/20 Hz TRUNK
22 CU 2W/20 Hz TRUNK
23 CU 2W/20 Hz TRUNK
24 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MACS	LAAMBN	MRC-135	8

1 TECHCON - TECHCON
2 TAOC - BCC
3 TAOC - BCC
4 CU 2W/20 Hz TRUNK
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

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AD-A167 908 MAGTF (MARINE AIR GROUND TASK FORCE) DATA TRANSFER ALTERNATIVES (1986-1996)(U) ELECTROSPACE SYSTEMS INC ARLINGTON VA APR 86 M00027-84-D-0033 3/5

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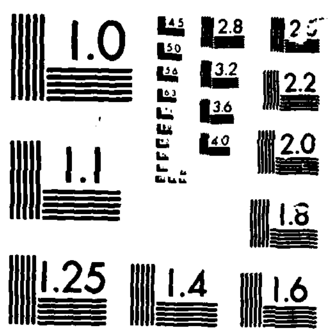

MICROCOP CHART

FIGURE 6-3.2. MULTICHANNEL RADIO ALLOCATION
AOA D+5 1986 (CONTINUED)

SOURCE	SINK	EQUIP	CHAN
DIV	MAW	GRC-201	24

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 TADC - FSCC
4 G3 - G3
5 G2 - G2
6 SSCT - SSCT
7 DSU - DSU
8 TADC - Air O.
9 TADC - DASC
10 TADC - DASC
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK
13 CU 2W/20 Hz TRUNK
14 CU 2W/20 Hz TRUNK
15 CU 2W/20 Hz TRUNK
16 CU 2W/20 Hz TRUNK
17 CU 2W/20 Hz TRUNK
18 CU 2W/20 Hz TRUNK
19 CU 2W/20 Hz TRUNK
20 CU 2W/20 Hz TRUNK
21 CU 2W/20 Hz TRUNK
22 CU 2W/20 Hz TRUNK
23 CU 2W/20 Hz TRUNK
24 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAW	MAG	GRC-201	24

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 TADC - OPS
4 TADC - OPS
5 G3 - S3
6 G2 - S2
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK
9 CU 2W/20 Hz TRUNK
10 CU 2W/20 Hz TRUNK
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK
13 CU 2W/20 Hz TRUNK
14 CU 2W/20 Hz TRUNK
15 CU 2W/20 Hz TRUNK
16 CU 2W/20 Hz TRUNK
17 CU 2W/20 Hz TRUNK
18 CU 2W/20 Hz TRUNK
19 CU 2W/20 Hz TRUNK
20 CU 2W/20 Hz TRUNK
21 CU 2W/20 Hz TRUNK
22 CU 2W/20 Hz TRUNK
23 CU 2W/20 Hz TRUNK
24 CU 2W/20 Hz TRUNK

6.4.2 Internal AOA Communications D+11, 1986. Figure 6-4.1, as previously mentioned, shows only the additional circuits established since D+5.

6.4.2.1 Single Channel Communications D+11, 1986. The single channel radio circuits to FSSG will be backup circuits to the multichannel radio system and installed landlines. Wing circuits to the TAE will also remain as a backup system.

6.4.2.2 Multichannel Communications, D+11, 1986. The multichannel system will expand on D+11 to include FSSG. This is depicted in figure 6-4.2.

6.5 D-Day, 1991

As previously noted, D-Day refers to the period of time it takes to make the assault and expand the beachhead to the degree that major OPFACs, including the Division CP, are ashore. The following subparagraphs and diagrams describe the evolution of communication during the D-Day period in the 1991 time frame.

6.5.1 External Communications D-Day, 1991. In the 1991 timeframe, external communications will be identical to the 1986 time period. CATF will provide Navy entry into national systems during the movement to the objective area. This will continue until the AN/TSC-96 satellite terminal and AN/TSC-95 HF terminal are established ashore. Once this occurs the capability exists to enter national systems directly from the AOA or via the TAE. Figure 6-5.1 and 6-5.2 reflect this.

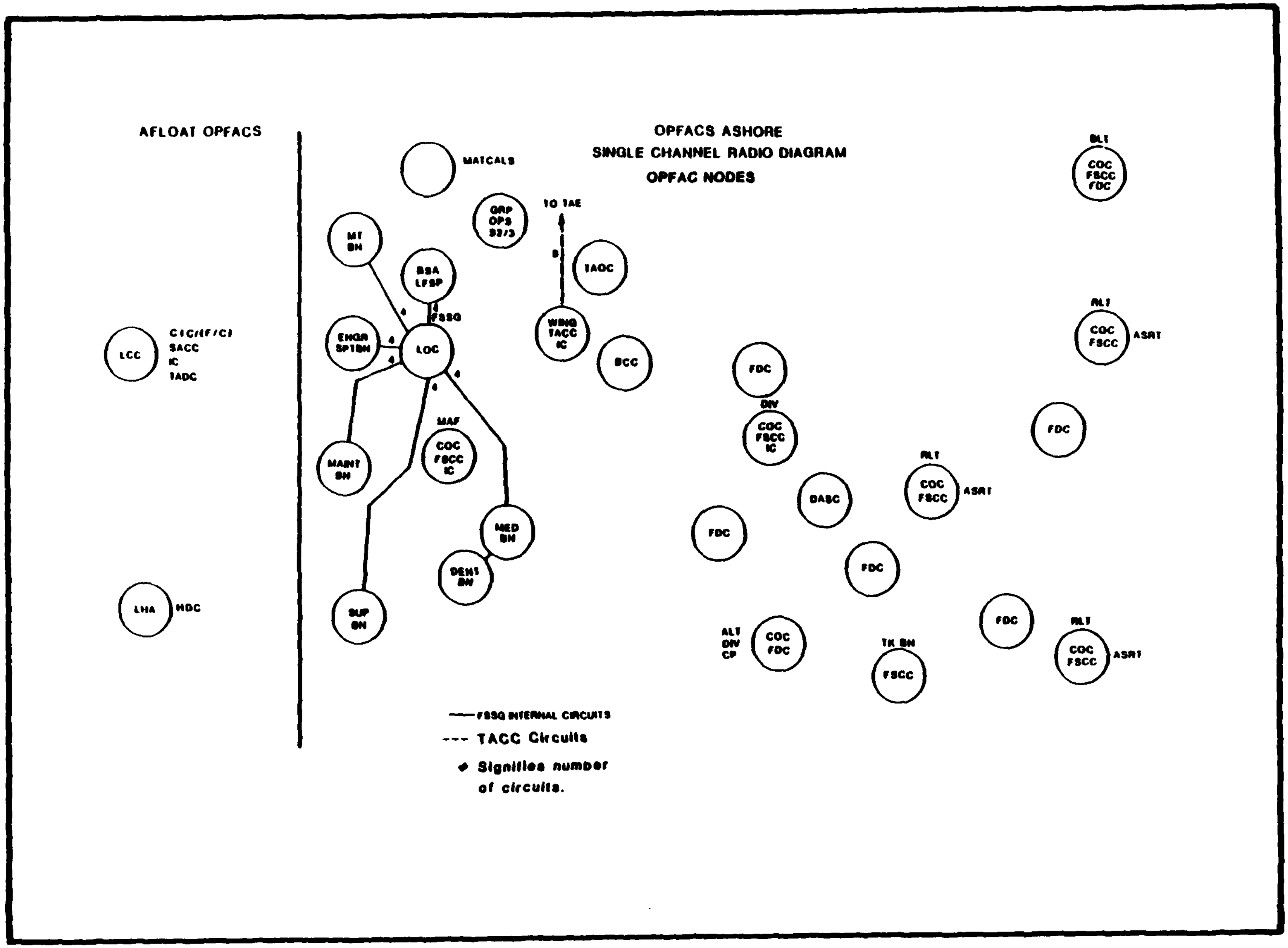

Figure 6-4.1. Single Channel Radio AOA D+11 (1986-1991)

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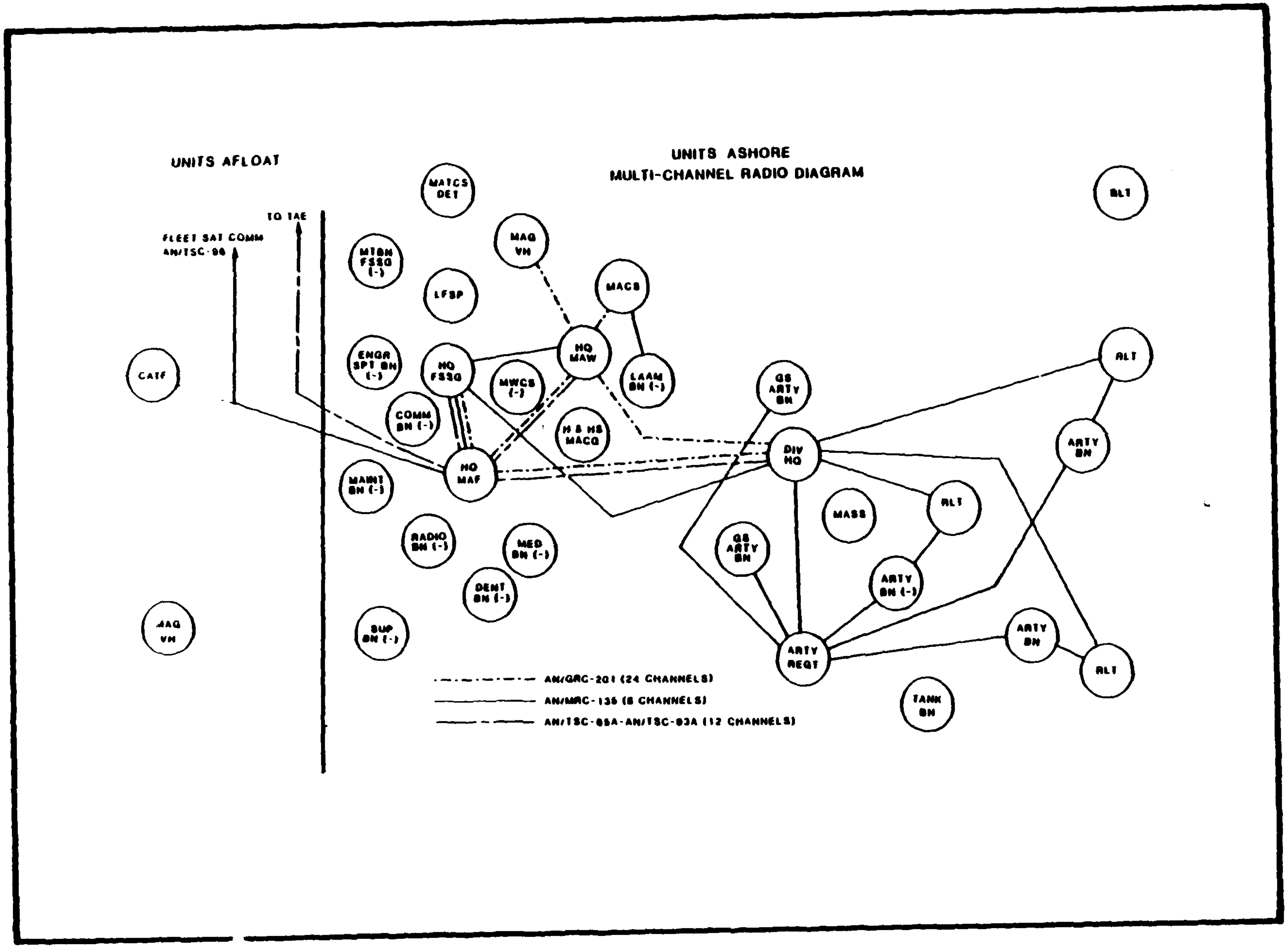

Figure 6-4.2 Multichannel Radio AOA D+11 (1986)

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FIGURE 6-4.2. MULTICHANNEL RADIO ALLOCATION
AOA D+11 1986 (CONTINUED)

SOURCE	SINK	EQUIP	CHAN
MAF	FSSG	MRC-135	8

1 SYSCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 G4 - G4
4 SUPO - SUPO
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
FSSG	DIV	MRC-135	8

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 G4 - G4
4 SUPO - SUPO
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
FSSG	MAW	MRC-135	8

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 G4 - G4
4 CU 2W/20 Hz TRUNK
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAF	FSSG	GRC-201	24

1 SYSCON - TECHCON
2 WPM TTY H/DUX (COMM. CEN)
3 COC-TLOC, HOT
4 G-4 - G-4
5 SUPO - SUPO
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK
9 CU 2W/20 Hz TRUNK
10 CU 2W/20 Hz TRUNK
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK
13 CU 2W/20 Hz TRUNK
14 CU 2W/20 Hz TRUNK
15 CU 2W/20 Hz TRUNK
16 CU 2W/20 Hz TRUNK
17 CU 2W/20 Hz TRUNK
18 CU 2W/20 Hz TRUNK
19 CU 2W/20 Hz TRUNK
20 CU 2W/20 Hz TRUNK
21 CU 2W/20 Hz TRUNK
22 CU 2W/20 Hz TRUNK
23 CU 2W/20 Hz TRUNK
24 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAF	FSSG	TSC-93A	12

1 SYSCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 COC - LOC, HOT
4 WWMCCS
5 G4 - G4
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK
9 CU 2W/20 Hz TRUNK
10 CU 2W/20 Hz TRUNK
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK

In the 1991 timeframe, a problem exists with regard to multichannel between the AOA and CATF. The AN/MRC-139, UHF multiplex, also known as the Digital Wideband Transmission System (DWTS), has a beam antenna system and is more dependent upon line-of-sight transmission paths. Presently, there are no plans to replace shipboard VCC-2 equipment with this system. The AN/MRC-135 or a replacement system is required to maintain the ship-to-shore link.

As depicted in figures 6-2.1, 6-2.2 and 6-5.1, external communications from the TAE remains the same as in the 1986 era for all phases of the operation. The AN/TRC-170 and AN/MRC-139 will replace the AN/GRC-201 and AN/MRC-135, respectively, for internal TAE multichannel shots thus providing additional channels, in the case of the AN/TRC-170, and increased throughput capacity in both.

6.5.2 Internal AOA Communications D-Day, 1991. The following subparagraphs discuss the development of single channel and multichannel communications in the AOA.

6.5.2.1 Single Channel Communications D-Day, 1991. The single channel system depicted in figure 6-3.1 remains in effect for the 1991 timeframe. Newer equipments such as SINCGARS will replace current inventory equipment as discussed in section 5.

6.5.2.2 Multichannel Communications D-Day, 1991. Figure 6-5.2 depicts the 1991 multichannel system for the AOA. The replacement of the AN/GRC-201 with the AN/TRC-170 and the replacement of the AN/MRC-135 with the AN/MRC-139 are reflected in the figure.

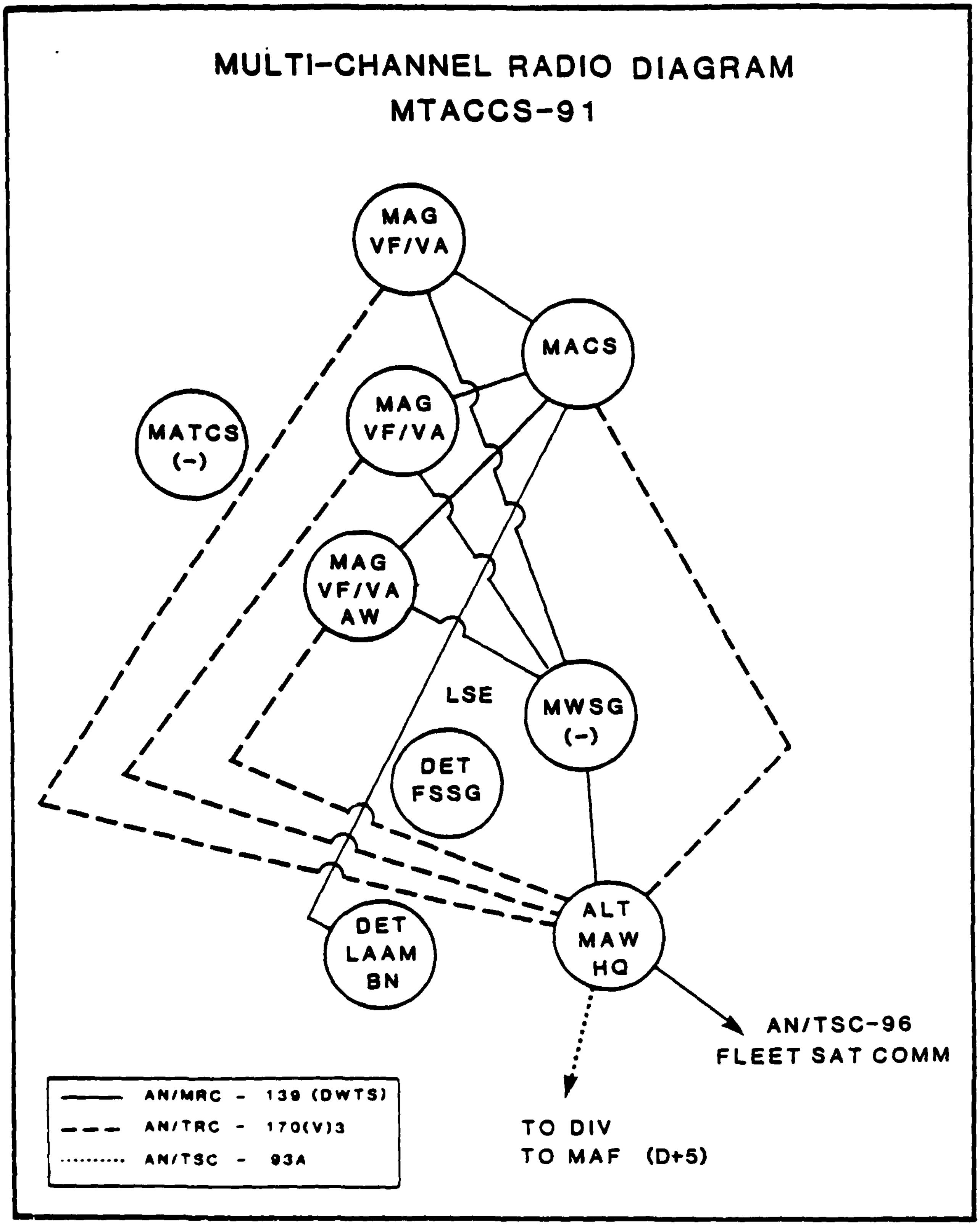

Figure 6-5.1. Multichannel Radio TAE D-Day to D+11 (1986-1991)

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FIGURE 6-5.1. MULTICHANNEL RADIO ALLOCATION
TAE D-DAY THRU D+11 1991 MTACCS (CONTINUED)

SOURCE	SINK	EQUIP	CHAN
ALT MAW HQ	MWSG	MRC-139	8

1 TECHCON - TECHCON
2 G4 - S4
3 100 WPM TTY, H/DUX (COMM. CEN)
4 CU 2W/20 Hz TRUNK
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
ALT MAW HQ	MAG	TRC-170	32

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 TADC - OPS
4 TADC - OPS
5 G3 - S3
6 G2 - S2
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK
9 CU 2W/20 Hz TRUNK
10 CU 2W/20 Hz TRUNK
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK
13 CU 2W/20 Hz TRUNK
14 CU 2W/20 Hz TRUNK
15 CU 2W/20 Hz TRUNK
16 CU 2W/20 Hz TRUNK
17 CU 2W/20 Hz TRUNK
18 CU 2W/20 Hz TRUNK
19 CU 2W/20 Hz TRUNK
20 CU 2W/20 Hz TRUNK
21 CU 2W/20 Hz TRUNK
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23 CU 2W/20 Hz TRUNK
24 CU 2W/20 Hz TRUNK
25 CU 2W/20 Hz TRUNK
26 CU 2W/20 Hz TRUNK
27 CU 2W/20 Hz TRUNK
28 CU 2W/20 Hz TRUNK
29 CU 2W/20 Hz TRUNK
30 CU 2W/20 Hz TRUNK
31 CU 2W/20 Hz TRUNK
32 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
ALT MAW HQ	MACS	TRC-170	32

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 TADC - TAOC
4 TADC - TAOC
5 TADC - TAOC (ICDL)
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK
9 CU 2W/20 Hz TRUNK
10 CU 2W/20 Hz TRUNK
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK
13 CU 2W/20 Hz TRUNK
14 CU 2W/20 Hz TRUNK
15 CU 2W/20 Hz TRUNK
16 CU 2W/20 Hz TRUNK
17 CU 2W/20 Hz TRUNK
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25 CU 2W/20 Hz TRUNK
26 CU 2W/20 Hz TRUNK
27 CU 2W/20 Hz TRUNK
28 CU 2W/20 Hz TRUNK
29 CU 2W/20 Hz TRUNK
30 CU 2W/20 Hz TRUNK
31 CU 2W/20 Hz TRUNK
32 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAG	MACS	MRC-139	8

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 OPS - TAOC
4 OPS - TAOC
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

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FIGURE 6-5.1. MULTICHANNEL RADIO ALLOCATION
TAE D-DAY THRU D+11 1991 MTACCS (CONTINUED)

SOURCE	SINK	EQUIP	CHAN
MAG	MWSG	MRC-139	8

1 TECHCON - TECHCON
2 S4 - S4
3 100 WPM TTY, H/DUX (COMM. CEN)
4 CU 2W/20 Hz TRUNK
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MACS	LAAMBN	MRC-139	8

1 TECHCON - TECHCON
2 TAOC - BCC
3 TAOC - BCC
4 CU 2W/20 Hz TRUNK
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
ALT MAW HQ	EXT	TSC-96	3

1 CUDIX
2 100 WPM TTY, H/DUX (COMM. CEN)
3 SECURE VOICE

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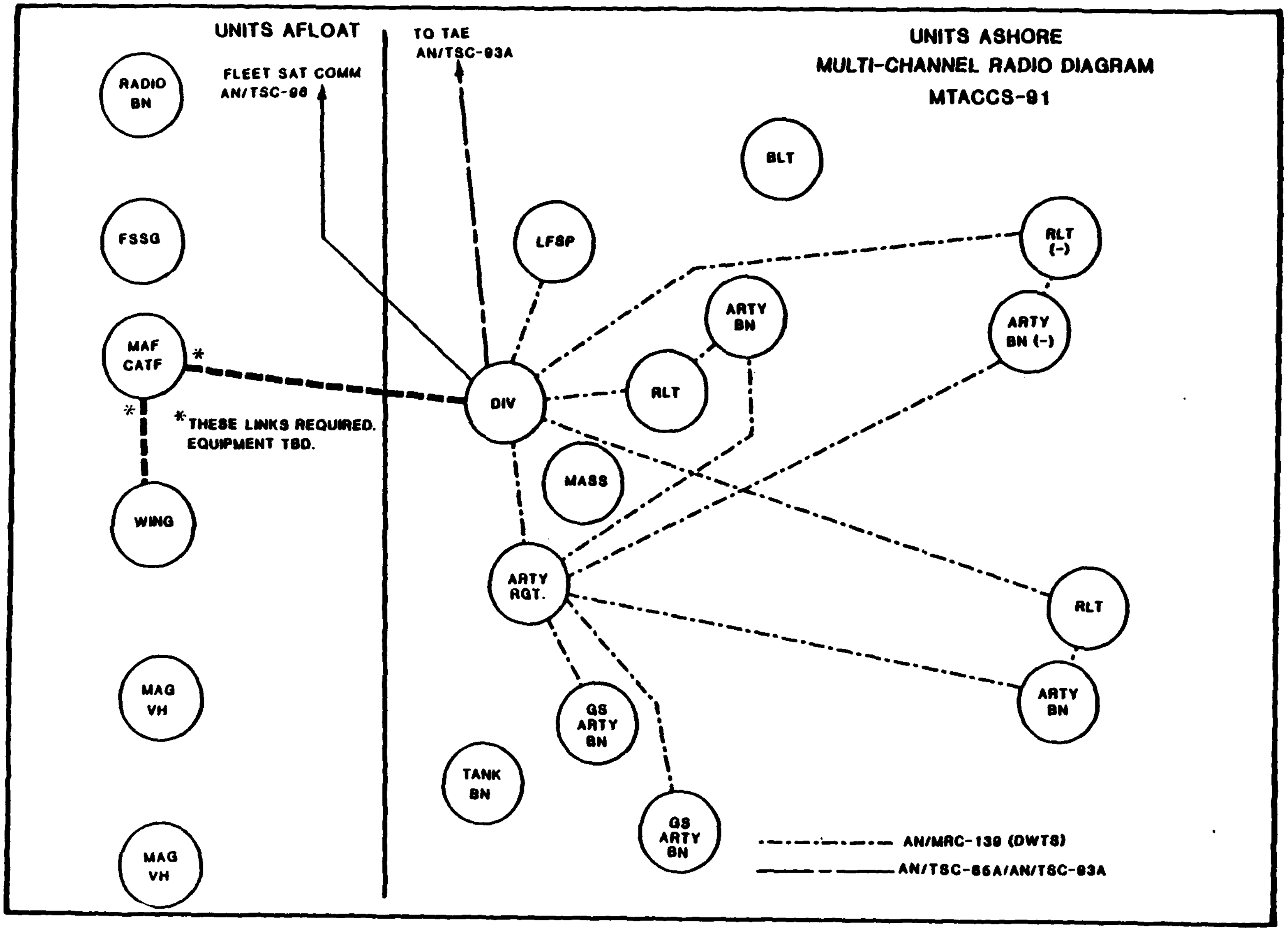

Figure 6-5.2. Multichannel Radio AOA D-Day (1991)

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FIGURE 6-5.2. MULTICHANNEL RADIO ALLOCATION
AOA D-DAY (MTACCS/1991) (CONTINUED)

SOURCE	SINK	EQUIP	CHAN
MAF	DIV	TBD	8

1 SYSCON - TECHCON, HOT
2 100 WPM TTY, H/DUX (COMM CEN)
3 COC - COC, HOT
4 WWMCCS
5 G-2 - G-2, HOT
6 MTACCS DATA
7 CU 2W/20 Hz TRUNK
8 SI CIRCUIT, HOT

SOURCE	SINK	EQUIP	CHAN
MAF	MAW	TBD	8

1 SYSCON - TECHCON, HOT
2 100 WPM TTY, H/DUX (COMM CEN)
3 COC - WING-3, HOT
4 WWMCCS
5 G2 - G2, HOT
6 MTACCS DATA
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
DIV	EXT	TSC-96	3

1 CUDIX
2 100 WPM TTY, H/DUX (COMM CEN)
3 SECURE VOICE

SOURCE	SINK	EQUIP	CHAN
DIV	TAE	AN/TSC-93A	12

1 TECHCON - TECHCON, HOT
2 100 WPM TTY, H/DUX (COMM. CEN)
3 COC - TAE TADC, HOT
4 WWMCCS
5 DASC - TAE TADC, HOT
6 MTACCS DATA (ULMS)
7 SSCT - SSCT, HOT
8 CU, 2W/20 Hz TRUNK
9 CU, 2W/20 Hz TRUNK
10 CU, 2W/20 Hz TRUNK
11 CU, 2W/20 Hz TRUNK
12 CU, 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
DIV	LFSP	MRC-139	8

1 G4 - LFSP, HOT
2 CU 2W/20 Hz TRUNK
3 CU 2W/20 Hz TRUNK
4 Cu 2W/20 Hz TRUNK
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
DIV	ARTY REGT	MRC-139	8

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 COC - COC, HOT
4 G2 - S2, HOT
5 MTACCS DATA (ULMS)
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
DIV	IN FREGT	MRC-139	8

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 COC - COC, HOT
4 G2 - S2, HOT
5 MTACCS DATA (ULMS)
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
ARTY REGT	ARTY BN	MRC-139	8

1 COMMCON - COMMCON, HOT
2 FAX
3 MTACCS DATA (ULMS)
4 S2 - S2, HOT
5 COC - LOC
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
INF REG	ARTY BN	MRC-139	8

1 COMMCON - COMMCON, HOT
2 FAX
3 MTACCS DATA (ULMS)
4 S2 - S2, HOT
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

6.6 D+5, 1991

The transmission paths for the 1991 timeframe remain the same as in the 1986 era. The number of channels available increases for multichannel with the introduction of the AN/TRC-170 as previously mentioned.

6.6.1 External Communications D+5, 1991. There is no change in external communications from 1986. Figure 6-2.1 and 6-3.1, depict the single channel configurations for both time periods. Figures 6-5.1 and 6-6.1 depict the multichannel configurations.

6.6.2 Internal AOA Communications D+5, 1991

6.6.2.1 Single Channel Communications D+5, 1991. Figure 6-3.1 depicts the single channel configuration for 1991. It remains the same as the 1986 time frame.

6.6.2.2 Multichannel Communications D+5, 1991. Figure 6-6.1 with associated channel allocations shows the recommended multichannel system.

6.7 D+11, 1991

The following subparagraphs are listed to identify appropriate figures and channel allocations for D+11 in the 1991 time frame.

6.7.1 External Communications D+11, 1991. External communications for D+11 are the same as for 1986. Figures 6-2.1, 6-2.2, 6-4.1, 6-4.2, 6-5.1 and 6-7.1 apply.

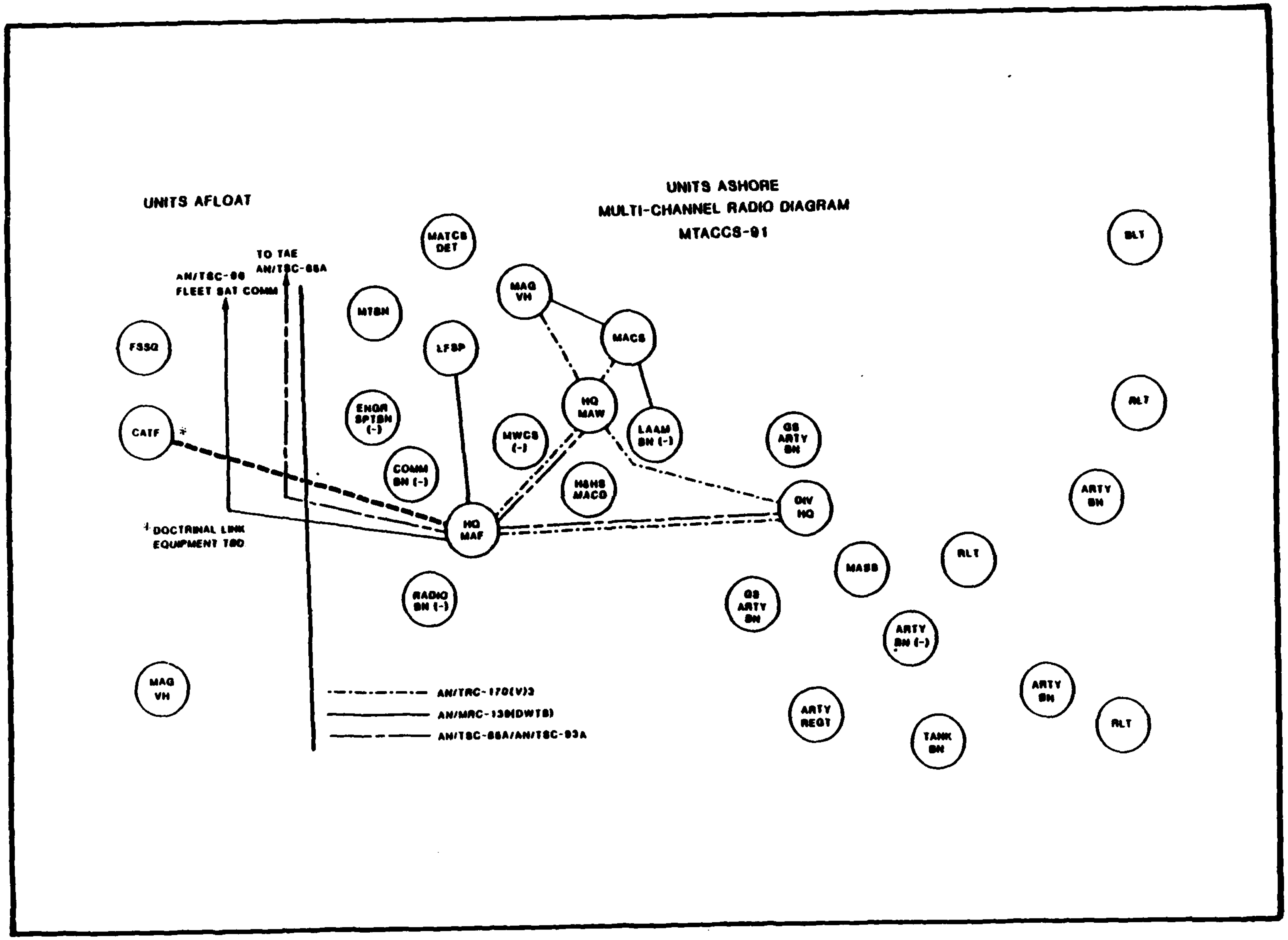

Figure 6-6.1. Multichannel Radio AOA D+5 (1991)

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FIGURE 6-6.1. MULTICHANNEL RADIO ALLOCATION
AOA D+5 (MTACCS/1991)(CONTINUED)

SOURCE	SINK	EQUIP	CHAN
CATF	MAF	TBD	8

1 TECHCON - SYSCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 SACC - FSCC
4 JIC - G2
5 SSES - SSCC
6 TACC - FSCC
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAF	EXT	TSC-96	3

1 CUDIX
2 100 WPM TTY, H/DUX (COMM. CEN)
3 SECURE VOICE

SOURCE	SINK	EQUIP	CHAN
MACS	LAAMBN	MRC-139	8

1 TECHCON - TECHCON
2 TAOC - BCC
3 TAOC - BCC
4 CU 2W/20 Hz TRUNK
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAF	TAE	TSC-85A	12

1 TECHCON - TECHCON, HOT
2 100 WPM TTY, H/DUX (COMM. CEN)
3 COC - TAE TADC, HOT
4 WWMCCS
5 DASC - TAE TADC, HOT
6 MTACCS DATA
7 SSCC - SSCT, HOT
8 CU 2W/20 Hz TRUNK
9 CU 2W/20 Hz TRUNK
10 CU 2W/20 Hz TRUNK
11 CU 2W/20 Hz TRUNK
12 CU 2/W 20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAF	DIV	TSC-85-A	12

1 TECHCON - TECHCON, HOT
2 100 WPM TTY H/DUX (COMM. CEN)
3 COC - COC, HOT
4 WWMCCS
5 DASC - TAE TADC, HOT
6 MTACCS DATA (ULMS)
7 SSCC - SSCT, HOT
8 G2 - G2, HOT
9 CU 2W/20 Hz TRUNK
10 CU 2W/20 Hz TRUNK
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK

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FIGURE 6-6.1. MULTICHANNEL RADIO ALLOCATION
AOA D+5 (MTACCS/1991) (CONTINUED)

SOURCE	SINK	EQUIP	CHAN
MAF	DIV	TRC-170	32

1 TECHCON - TECHCON, HOT
2 100 WPM TTY, H/DUX (COMM. CEN)
3 MTACCS DATA
4 G3 - G3, HOT
5 G2 - G2, HOT (MAGIS)
6 DSU - DSU, HOT
7 SSCC - SSCT, BACK-UP
8 FSCC - DASC, HOT
9 FSCC - DASC, HOT
10 G4 - G4, HOT
11 CU 2W/20 Hz TRUNK
12 WWMCCS
13 CU 2W/20 Hz TRUNK
14 CU 2W/20 Hz TRUNK
15 CU 2W/20 Hz TRUNK
16 CU 2W/20 Hz TRUNK
17 CU 2W/20 Hz TRUNK
18 CU 2W/20 Hz TRUNK
19 CU 2W/20 Hz TRUNK
20 CU 2W/20 Hz TRUNK
21 CU 2W/20 Hz TRUNK
22 CU 2W/20 Hz TRUNK
23 CU 2W/20 Hz TRUNK
24 CU 2W/20 Hz TRUNK
25 CU 2W/20 Hz TRUNK
26 CU 2W/20 Hz TRUNK
27 CU 2W/20 Hz TRUNK
28 CU 2W/20 Hz TRUNK
29 CU 2W/20 Hz TRUNK
30 CU 2W/20 Hz TRUNK
31 CU 2W/20 Hz TRUNK
32 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAF	MAW	TSC-93A	12

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 MTACCS DATA (ULMS)
4 G3 - G3
5 G2 - G2
6 SSCC - SSCT
7 DSU - DSU
8 IAC - TERPES
9 IAC - II
10 CU 2W/20 Hz TRUNK
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 HZ TRUNK

MAF	LFSP	MRC-139	8

1 COMM. COORD.
2 G4 - S4
3 CU 2W/20 Hz TRUNK
4 CU 2W/20 Hz TRUNK
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

MAW	DIV	TRC-170	32

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 MTACCS DATA (ULMS)
4 G3 - G3
5 G2 - G2
6 SSCT - SSCT
DSU - DSU
8 TADC - Air O.
9 TADC - DASC
10 TADC - DASC

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FIGURE 6-6.1. MULTICHANNEL RADIO ALLOCATION
AOA D+5 (MTACCS/1991) (CONTINUED)

SOURCE	SINK	EQUIP	CHAN
MAW	DIV	TRC-170	32

11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK
13 CU 2W/20 Hz TRUNK
14 CU 2W/20 Hz TRUNK
15 CU 2W/20 Hz TRUNK
16 CU 2W/20 Hz TRUNK
17 CU 2W/20 Hz TRUNK
18 CU 2W/20 Hz TRUNK
19 CU 2W/20 Hz TRUNK
20 CU 2W/20 Hz TRUNK
21 CU 2W/20 Hz TRUNK
22 CU 2W/20 Hz TRUNK
23 CU 2W/20 Hz TRUNK
24 CU 2W/20 Hz TRUNK
25 CU 2W/20 Hz TRUNK
26 CU 2W/20 Hz TRUNK
27 CU 2W/20 Hz TRUNK
28 CU 2W/20 Hz TRUNK
29 CU 2W/20 Hz TRUNK
30 CU 2W/20 Hz TRUNK
31 CU 2W/20 Hz TRUNK
32 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAF	MAW	TRC-170	32

1 TECHCON - TECHCON, HOT
2 100 WPM TTY, H/DUX (COMM. CEN)
3 MTACCS DATA
4 G3 - G3, HOT
5 G2 - G2, HOT
6 DSU - DSU, HOT
7 SSCC - SSCT, HOT
8 IAC - TERPES
9 IAC - II
10 CU 2W/20 Hz TRUNK
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK
13 CU 2W/20 Hz TRUNK
14 CU 2W/20 Hz TRUNK
15 CU 2W/20 Hz TRUNK
16 CU 2W/20 Hz TRUNK
17 CU 2W/20 Hz TRUNK
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31 CU 2W/20 Hz TRUNK
32 CU 2W/20 Hz TRUNK

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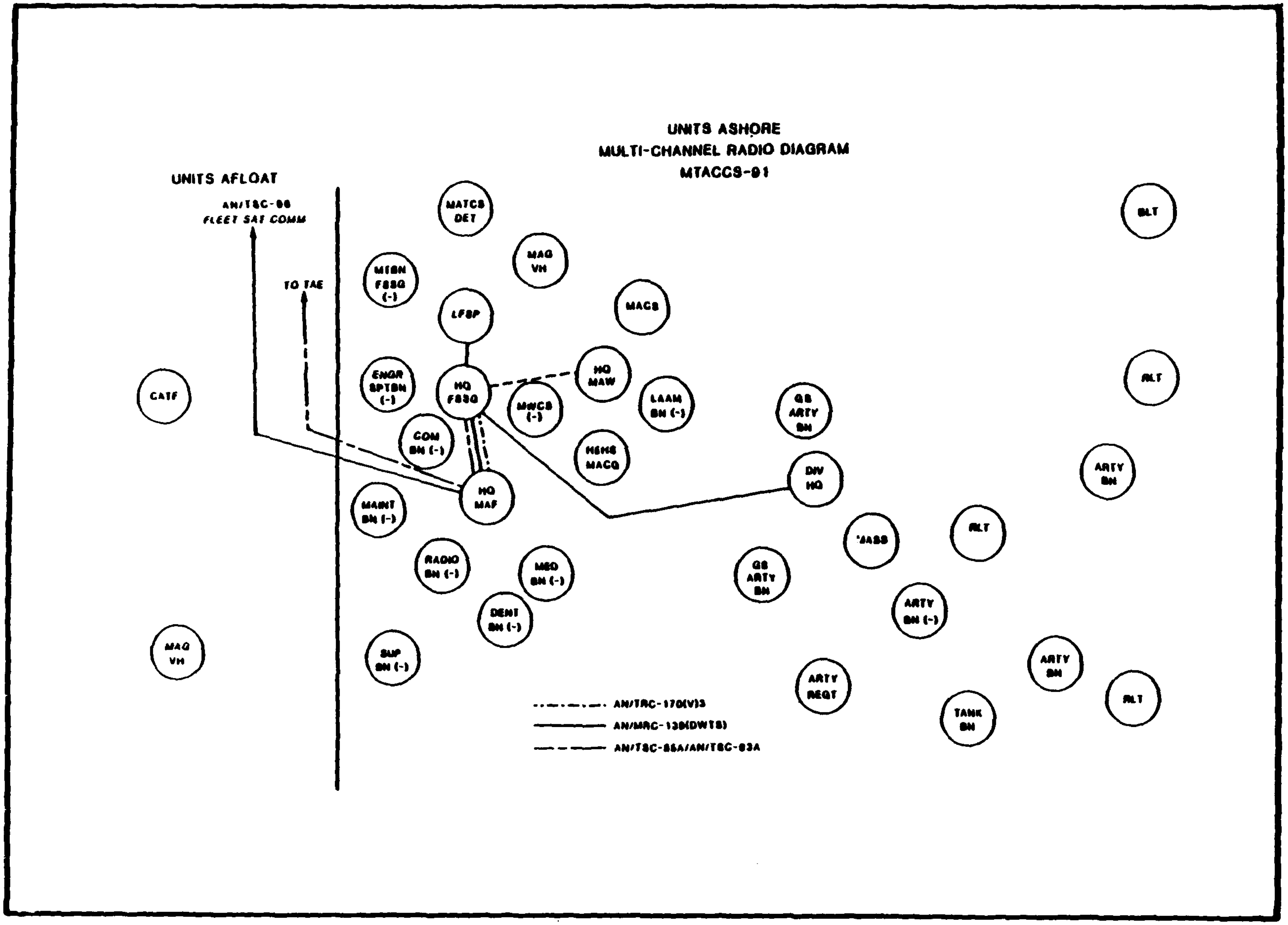

Figure 6-7.1. Multichannel Radio AOA D+11 (1991)

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FIGURE 6-7.1 MULTICHANNEL RADIO ALLOCATION
AOA D+11 (MTACCS/1991) (CONTINUED)

SOURCE	SINK	EQUIP	CHAN
MAF	FSSG	TSC-93A	12

1 SYSCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 COC - LOC, HOT
4 WWMCCS
5 G4 - G4
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK
9 CU 2W/20 Hz TRUNK
10 CU 2W/20 Hz TRUNK
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAF	FSSG	MRC-139	8

1 SYSCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 SUPO - SUPO
4 CU 2W/20 Hz TRUNK
5 COC - LOC
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
FSSG	DIV	MRC-139	8

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 G4 - G4
4 SUP - SUPO
5 CU 2W/20 Hz TRUNK
6 LOC - COC
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
FSSG	MAW	MRC-139	8

1 TECHCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 G4 - G4
4 CU 2W/20 Hz TRUNK
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK

SOURCE	SINK	EQUIP	CHAN
MAF	FSSG	TRC-170	32

1 SYSCON - TECHCON
2 100 WPM TTY, H/DUX (COMM. CEN)
3 COC - TLOC, HOT
4 G4 - G4
5 CU 2W/20 Hz TRUNK
6 CU 2W/20 Hz TRUNK
7 CU 2W/20 Hz TRUNK
8 CU 2W/20 Hz TRUNK
9 CU 2W/20 Hz TRUNK
10 CU 2W/20 Hz TRUNK
11 CU 2W/20 Hz TRUNK
12 CU 2W/20 Hz TRUNK
13 CU 2W/20 Hz TRUNK
14 CU 2W/20 Hz TRUNK
15 CU 2W/20 Hz TRUNK
16 CU 2W/20 Hz TRUNK
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29 CU 2W/20 Hz TRUNK
30 CU 2W/20 Hz TRUNK
31 CU 2W/20 Hz TRUNK
32 CU 2W/20 Hz TRUNK

6.7.2. Internal AOA Communications D+11, 1991

6.7.2.1 Single Channel Communications D+11, 1991. Figure 6-4.1 details the 1986 and 1991 time period.

6.7.2.2 Multichannel Communications D+11, 1991. Figure 6-7.1 and associated channel allocation depict the 1991 configuration for D+11.

SECTION 7. MAGTF AIS DATA TRANSFER ALTERNATIVES

7.1 Introduction

7.1.1 Background. The principal factors bearing on MAGTF data transfer options are the architectures and concepts of operation of the AIS and LFICS resources. The architecture and concepts of operation of both the AIS and LFICS resources have been covered in detail in the preceding sections. They are summarized here in terms of alternative means of data transfer.

Major AISs are being redesigned to support interactive data base operations. This includes systems necessary to assure the sustained operations of deployed MAGTFs. Although emphasis to date has been on garrison operations, they set the stage for deployed requirements. In garrison, units will be electronically connected to their RASC for interactive updating of data and subsequent down-loading of complete data bases back to the unit. The on-line communications necessary to this mode of operations are provided by the MCDN. This process involves AISs which are controlled as shown in figure 7-1. As demonstrated therein, a well defined operational and configuration control structure exists. This is essential to assuring that the evolution of deployed AIS applications in the separate FMFs and MAGTFs is consistent with their merging into larger integrated forces.

Concern has been expressed that, "there is no firm concept of operation for the use of AISs in the field." While this may be true, it is not unusual. In reality, concepts of operation, or how a system is going to be used, evolve with the system. Even when preliminary concepts are prepared, they

begin to change rapidly as the system matures and institutional experience is accumulated. In case of the deployable AIS's, there is an obvious set of evolving concepts which can be used to develop data transfer alternatives.

The developing concept is toward FMF units having intelligent terminals tied directly into major computer facilities for interactive processing. This is now being accomplished, to varying degrees in garrison and will increase with the redesign of major AISs and allocation of ADPE/FMF and other EUCE, down to the battalion and separate company levels. Development of the DFASC/MASC clearly indicates an intention to extend this trend into the AOA by deploying a major AIS facility with a MAGTF when feasible. This supports the policy established in the C2MP that systems developed for the FMF must be functional in combat as well as in garrison. It is also a logical development and follows precedents set by other electronic C3 systems such as microwave transmission, automatic switching and tactical data systems.

Concurrently, the communications systems are becoming more capable of supporting data communications traffic. Fleet Satellite Communications and Defense Satellite Communications System resources are being added to improve both internal and external communications capabilities. Existing systems are being upgraded to include better digital capability in the form of the GRC-201, and possible addition of two 16 KBPS wide band channels to the MRC-135. Acquisition of selected TRITAC systems will further provide wide-band, multichannel digital transmission and switching capability down to the regimental level. Concurrently, acquisition of the DCT provides a programmable capability to transmit and receive both formatted and free text digital messages over single-channel radios. This extends the digital capability down to maneuver units.

The introduction of tactical data systems (TDS) created a basic change in the concepts of communications in the FMF. Historically, a single channel radio was the primary means in the AOA with multichannel and cable being viewed as alternative or back-up means. TDS requirements signalled a change wherein the multichannel/ULMS systems became the primary means of connectivity. Concurrently, there has been a change to a policy, as stated in the C2MP, that the LFICS multichannel and switching systems will become primarily a common user system. Entry into the switched system will be on a subscriber call up basis.

When MAUs deploy today, they take their ADPE/FMF and local data bases with them and communicate back to the RASC via mail, courier or Naval message.

Current plans in the Command and Control Master Plan and in MCO 5230.10A consider this same method for units in the AOA. The method of getting information back to the DFASC would be courier. The DFASC would then consolidate the information and use mail, courier or Naval message to update the files at the RASC. Although marginal, this is a baseline situation and will continue as an alternative for periods when on-line electronic transmission capabilities do not exist.

7.1.2 Data Transfer Alternatives. Using the criteria expressed in section 4 and the organization shown in figure 7-1, several requirements exist for AIS data transfer within and external to the AOA. The basic alternatives for meeting these requirements are:

1. Courier with magnetic or paper media and batch transfer to DFASC/RASC.

2. Direct communications to RASC from selected ADPE-FMF equipments.

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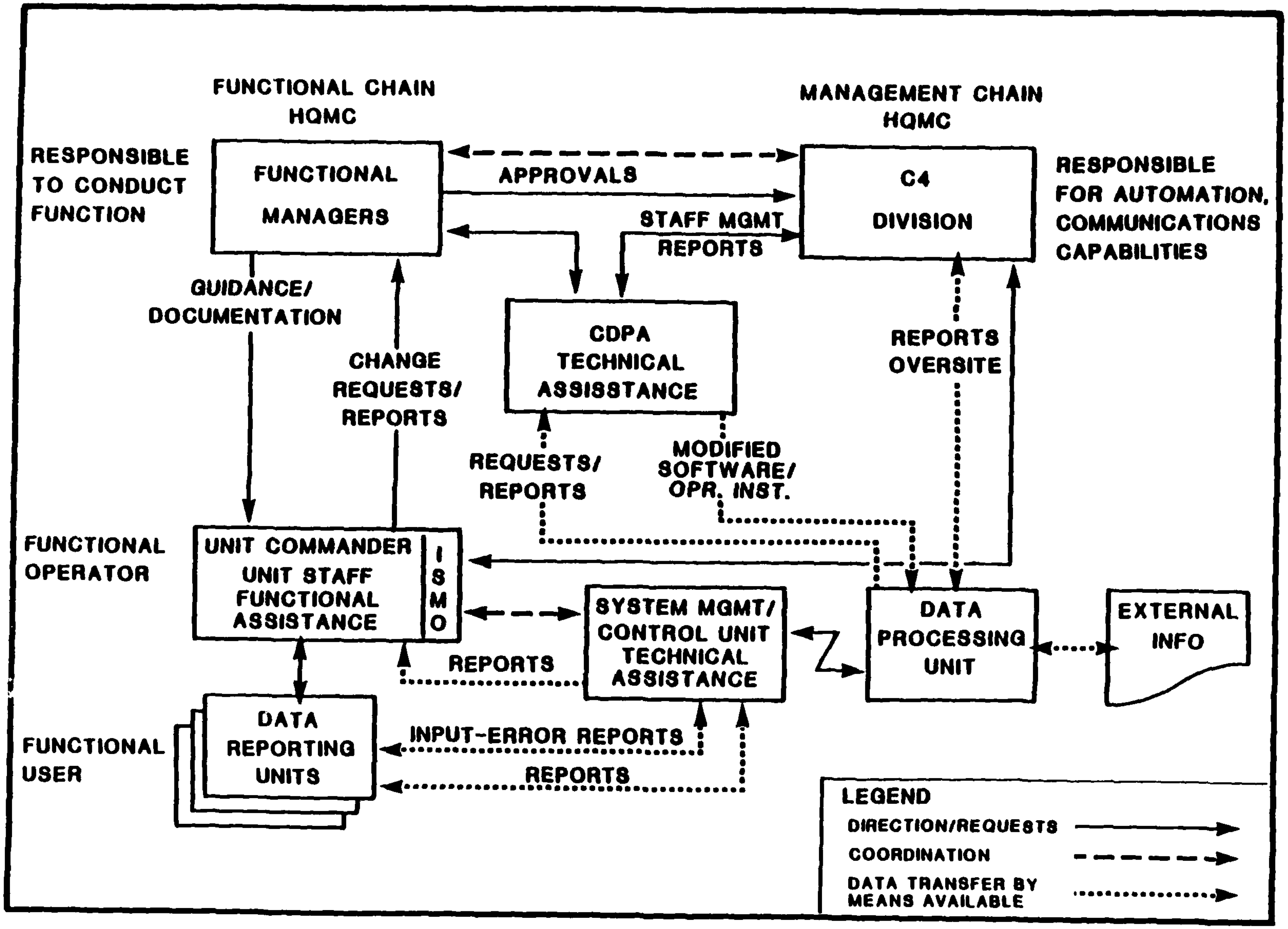

Figure 7-1. Functional and Management Chain for AIS

3. Interactive communications with DFASC and batch transfer DFASC to RASC.

The following paragraphs discuss these alternatives in terms of their applicability to the MAGTF and Marine Corps requirements.

7.1.2.1 Alternative 1. The first alternative is to continue as we are today. Units with ADPE-FMF equipment, terminals and phase II EUCE will continue to interface directly with the RASC in garrison. When deployed, they will update the RASC by courier, mail or Naval message. If the DFASC is available, they will use it for some limited local applications, consolidation of their AIS updates and AUTODIN transfer back to the RASC.

The advantages of this alternative are:

- o The ADPE and procedures used in the deployed, combat environment are similar to those used, and trained on, in the garrison environment.
- o This is the start-up and fall-back option which must exist when the DFASC/MASC and other communications means are not available.
- o It supports the C2MP requirement for a mandatory manual backup capability.
- o AIS functions are integrated with the operation to minimize the transition shock involved when phasing into a combat ashore environment.
- o AIS operations responsibility can be quickly shifted between units afloat and ashore.

- The flexibility exists to expand the system size and span of support to satisfy the requirements imposed by varying intensities and durations of operations ashore.

- Provides the essential contact between the deployed units and the the Marine Corps Supporting Establishment.

The disadvantages of Alternative 1 are:

- It does not provide timely Class I system updates.

- It does not take advantage of the communications capability of the Landing Force.

- It does not take advantage of the ADP state-of-the-practice available to the redesigned AISs. Interactive updates and inquiries are not achieved.

- This approach is only oriented to the Class I system support. It requires more resources because a separate manual system is required to support the MAGTF Commander and his local AISOPACs.

7.1.2.2 Alternative 2. The second alternative is to have the ADPE-FMF equipment and other T/E computer equipment communicate directly with the RASC. This would be accomplished via satellite or other communications to the nearest node of the MCDN network in CONUS. Given the limited number of external channels, this is only a theoretical alternative in the near to mid-term.

The advantages of this alternative are:

- o It provides timely response to the Class I system updates.

- o It provides the necessary contact between the deployed units, and the Marine Corps Supporting Establishment.

The disadvantages of this alternative are:

- o It requires dedicated internal and external AOA communications channels to support AIS data transmissions.

- o This solution would still require alternative 1 as the start-up and fall-back option, so it is not any more timely during the initial stages.

- o It does not take advantage of either the communications or ADP capability of the Landing Force.

- o It does not support the MAF Commander or his AISOPFACs without separate manual systems.

- o It reduces flexibility of the MAF Commander by dictating his channel useage and priority.

7.1.2.3 <u>Alternative 3</u>. The third alternative is to have the DFASC or MASC function as a RASC in the AOA. It would embark with a dated copy of the RASC data bases required to support the MAGTF. Upon landing in the AOA, system control units (SMU, MMU, ACU) would be hard wired into the computer. Units adjacent to the DFASC or MASC vans would tie in through the FEP via hard wire. Distant units would input via the multichannel radio system.

Mobile combat units that can *not* set up the capability to interface directly with the computer, would communicate by courier, DCT or single channel radio to the system control unit. External communications of major AISs such as JUMPS/MMS/REAL FAMMIS or SASSY/MIMMS/M3S will be by bulk transfer of changes. The data bases in the DFASC/MASC would be considered the Master Data Bases for the MAGTF. Information from them would be used to update the MAGTF Commander and his subordinate commanders. The system control units would update the AISOPFAC as well as the OPFAC. For example, the ACU would prepare the casualty message, inform the MAGTF G-1 and back-feed the message to the unit commander.

The advantages of the 3rd alternative are the same as the 1st alternative with the following additional benefits:

- The MAF Commander and the AISOPACs are supported within the communications capability of the Landing Force.

- More timely information is available. Once multichannel nets are operational interactive updates and inquiries are possible.

- The ability to integrate management information to minimize the number of resources required to conduct support functions.

- Deployed AIS applications can be directed toward those functions that will increase the availability of human and material resources--either by reducing the time to perform tasks, shifting the people who perform the tasks or by increasing the management capability of the FMF Commanders.

7.1.2.4 Discussion of Alternatives. Alternative 1 is always an option which should be planned for as both a start-up and fall-back position. As such, Standing Operating Procedures are required in accordance with MCO 5230.10A.

Alternative 2 is too costly in communications resources and is unworkable in the current environment.

Alternative 3 reduces time and the error rate to an acceptable level to distribute the "master" data bases to the MAGTF Commander. This reduces the requirement for transmission of data to only changes on a daily basis. It also eliminates the duplicate system required by the other alternatives to inform the MAGTF Commander and it takes advantage of the state-of-the-practice in ADP and communications.

7.1.2.5 Conclusions. The conclusions are that alternative 1 should be planned for during the initial and fall back phase of operations and be replaced with alternative 3 as soon as necessary facilities are established ashore. This is the MAGTF Data Transfer Plan that this study recommends, and has designed a solution for, using the current and planned communication equipment.

7.2 Data Transfer Plan

In the context of this study, "Data Transfer", includes all of the options of moving data formatted information from one location to another. As much processing as possible should be done at the local level in order to reduce the amount of data transfer between nodes. The principal means available now are, in order of descending preference:

- o Interactive Communications
- o Batch Communications

- Couriered Discs
- Couriered Hardcopy

A Data Transfer Plan as used herein, is the collection of means of transfer at various phases in a given operation. In most cases, a combination of methods will be used. For example, in the case of an amphibious assault, a combination of all four methods will be required as the operation proceeds. In the planning phase, the RASC will be updated on an interactive basis from remote ADPE-FMF terminals. Subsequently, prior to embarkation selected ADPE-FMF terminals or a DFASC will be updated by batch downloading from the RASC. Ideally, this will be by electronic communications. However, it can be achieved by magnetic tape and should be backed up by magnetic tape in any event. Once afloat, the on-line options will be restricted by EMCON to disc, on-board hardwire, or LOS communications between ships when permitted.

Disc and hardcopy courier options would still be viable if the task force ships are beyond LOS but within courier ranges.

During the assault, the means will be constrained to courier and single channel radio to the degree that the DCT can be employed. As the beachhead is established and stabilized, the switched multichannel and DFASC/MASC resources will come gradually into operation and AIS traffic will become progressively more interactive. However, given the nature of an AOA with an expanding beachhead, maneuver units, forward echeloning command posts, major displacements and battle damage, there will always be a mixture of AIS data transfer means in operation.

Consequently, the optimum plan is one which considers the integration of these means on a basis that minimizes duplication, but precludes loss of

data. It will also allow selective transfer of data by priority. The latter is, and will remain, the commander's prerogative. Standard procedures can be set and programmed into the terminals and processors. However, the nature of AOA operations and communications resources requires a continuing reevaluation and adjustment of priorities. This includes both the order and means of tranfer.

The following paragraph describe a Data Transfer Plan in terms of:

- o Principal Means of Transfer
- o AIS Needlines
- o AIS Flowlines
- o Comparison of AIS Flowlines to Communications Configuration

7.2.1 Principal Means of Transfer. As indicated in the C^2 Master Plan, the introduction of TDS, and now AIS, concepts created a basic change in FMF communications concepts. Historically, the principal means of communications in the AOA was by single channel radio with multichannel and cable systems being in the alternative or back-up roles. The introduction of the TDS/AIS signalled a change to the multichannel/ULMS/ULCS as the primary means of connectivity. It is assumed that this change in primary means applies to the regimental and higher echelons.

Single channel radio remains as the principal means for battalions and below. However, the introduction of the DCT with its multiple formatted and free text input options and diverse interface capabilities extends digital reporting capability down to the maneuver unit level.

For purposes of this plan, multichannel radio with its associated cabling is considered as the primary means. Single channel radio and courier are viewed as secondary and tertiary, as required, methods.

7.2.2 AIS Needlines. Assuming the selection of Alternative 3, with Alternative 1 as back-up, there is a requirement to overlay the AIS information requirements configuration on the communications network. This is begun by development of AIS needlines. A needline is defined as the need for one agency to transfer information to another and is independent of the actual routing or flowline.

7.2.2.1 Logistics Systems Needlines. The logistics systems, including aviation logistics systems, which require a deployable ADP capability to support supply, maintenance, embarkation, and transportation functions (figures C-1 through C-46) have primary needlines which go from the AISOPFACs to the particular system control unit of the AIS for action and information exchange. There is also a secondary needline, not shown on the figures, through the hierarchical organization of the MAF to monitor the action, so that the information exchange action is known and supported at these levels. For example, a request for ammunition is sent directly to the SMU from the infantry battalion with the regiment and TLOC also receiving this information. This would normally be accomplished by single-channel radio in the voice or DCT mode.

7.2.2.2 Manpower Systems Needlines. Manpower systems, which support the personnel accounting and pay functions of Marines in combat, have primary needlines (figures C-47 through C-62) that go from the reporting unit or disbursing office to the ACU for action. The secondary needlines go to the hierarchical manpower AISOPFACs for necessary planning and support action. This includes the casualty and replacement functions of personnel accounting. For example, a battalion with casualties would send the name, SSN and

rank of each casualty to the ACU via single channel radio in the voice or DCT mode. Using the manpower data base, the ACU would complete the casualty report message after getting the medical status from the liaison at the medical facility where the casualty was sent to for treatment. The ACU would backfeed this message to the battalion at a later time. The chain of command would also have the information they need to support friendly capability planning.

7.2.2.3 Financial Systems Needlines. Financial systems needlines are by-products of the logistics and manpower systems. Figures C-63 through C-74 show these needlines supporting the financial AISOPFACs from the SASSY/MIMMS/M3S and JUMP/MMS/REAL FAMMIS systems. The DOV system is the exception since it is a daily accounting system for disbursing transactions.

7.2.2.4 Operational System Needlines. UNITREP is the operational system that the MAGTF Commander uses to report capability and status to higher headquarters. This system is supported by SASSY/MIMMS/M3S and JUMPS/MMS/REAL FAMMIS input to the operations officer. UNITREP needlines for pre-MTACCS and MTACCS are shown in figures C-75 through C-81.

7.2.3 AIS Flowlines. Information rarely moves directly from source to destination. The usual process is for it to flow within the established communications system. In determining the optimum flow of data to support the required needlines, the study examined the LFICS architecture as depicted in the C2 Master Plan and constrained itself to existing and planned communications assets for the FMF. This allowed us to analyze an optimum equipment suite within realistic bounds. The key guide used in developing the needed communications lines was the Fleet Marine Force Manual 10-1. As stated in the manual, it is designed to "serve as the basic communications planning manual." The document is "presented as a

guide." "The circuits shown, herein, do not represent a mandatory requirement" and "are to be used in a flexible manner when matched to the requirements of a modern MAGTF." The flowlines shown in figures 7-2 and 7-3 follow the hierarchical chain of command and traditional communications paths established for command and control. This is in consonance with the primary and secondary purposes of communications as stated in FMFM 10-1. It also supports the principle of "economy of force" and integrates AIS requirements with established operational doctrine, tactics and techniques of amphibious warfare. Section six of this study describes the general communications configurations that support the flowlines discussed herein.

7.3 Comparison of AIS Flowlines to Communications Configuration

7.3.1 Multichannel Employment to Support AIS Flow. Section 6 displays the multichannel diagrams for the three phases, D-Day, D+5 and D+11 for the pre-MTACCs and MTACCs era. These "backbone" systems will provide the primary means of transferring TDS and AIS data around the battlefield. As can be seen in the diagrams, the multichannel system evolves as forces move ashore. Section 6 shows recommended channel allocations for the multichannel links. As discussed in section 6, actual allocation is the prerogative of the commander. There is no standard channel assignment established in the Marine Corps. Some assignments have become quasi-standard through experience (e.g., G-3 to S-3 hotline) and these have been considered in creating the appendix. The common user links depicted have the capacity to carry operational and/or administrative traffic. The individual channel assignments can be either dedicated to a particular type traffic by direct connection of peripheral device or shared by many users. Sharing requires the employment of switching system in conjunction with the multichannel channels to be shared. The peripheral device (e.g., telephone, facsimile, computer) is connected via the switching system. For a computer or facsimile device to operate in this manner a dial-up modem to

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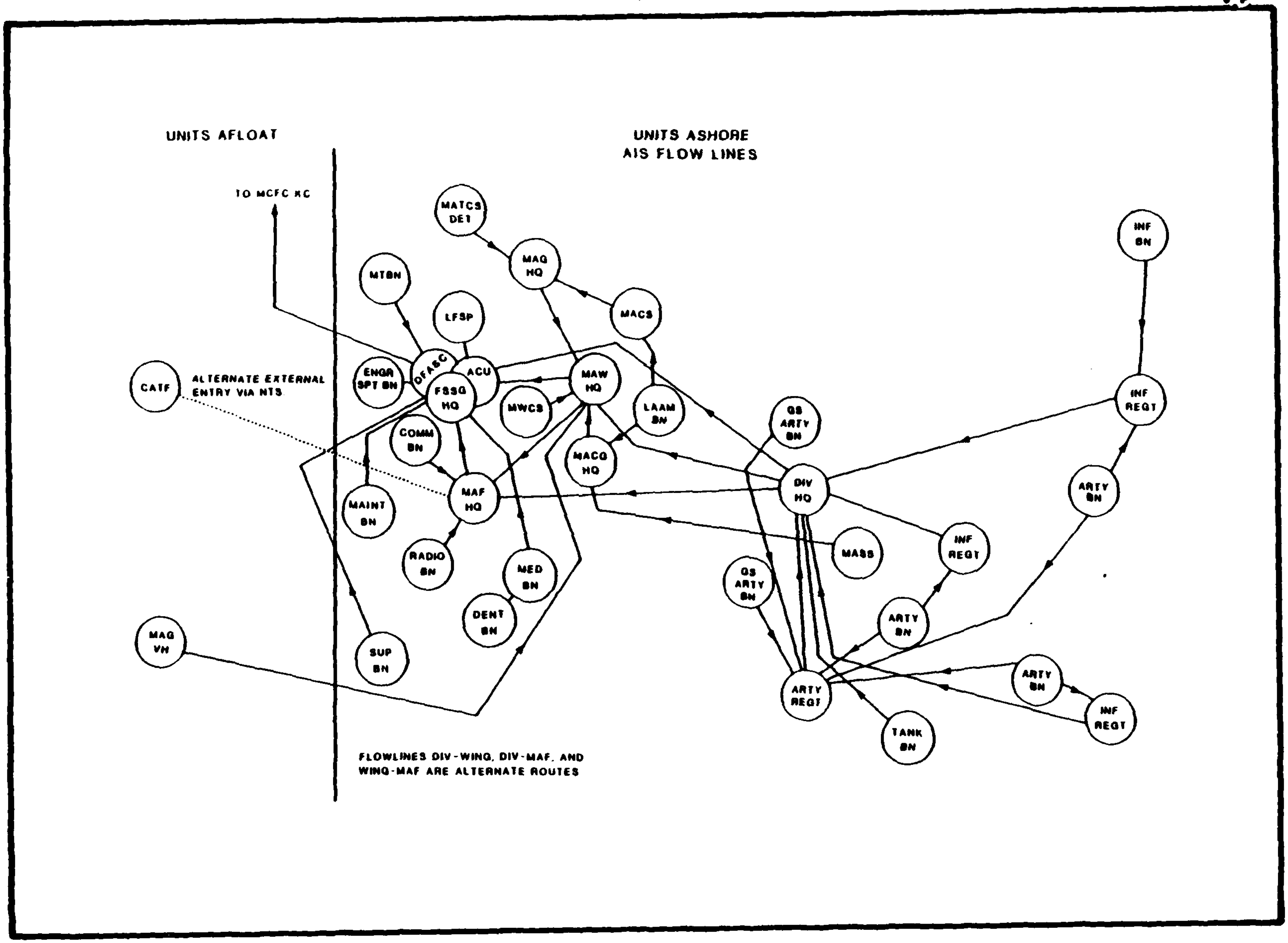

Figure 7-2. AIS Flowlines D+11 (AOA)

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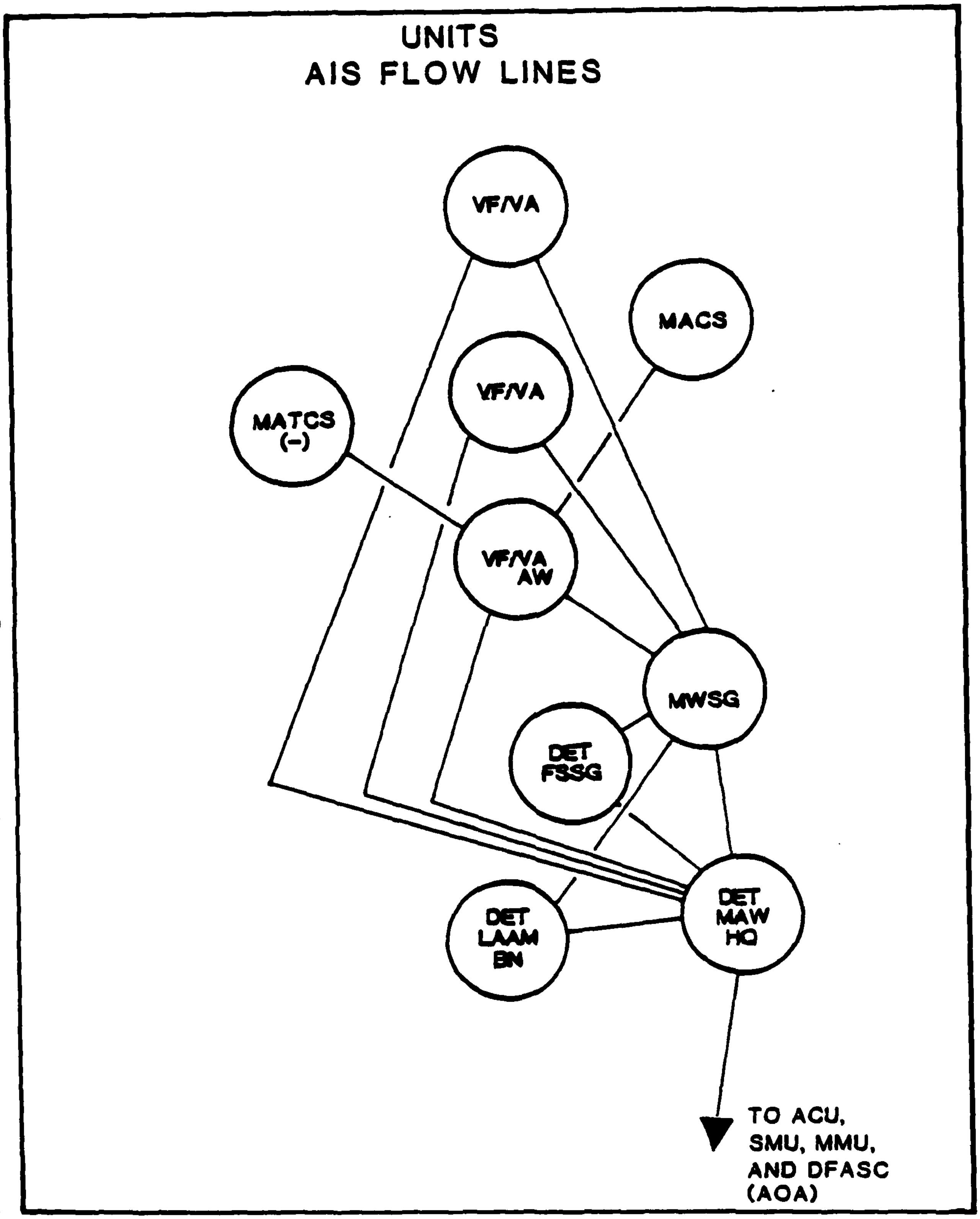

Figure 7-3. AIS Flowlines D-Day to D+11 (TAE)

signal the switching system is required. Sharing of the channels by many users allows for optimal use of the multichannel system and is the recommended method for this plan.

7.3.2 <u>Link Capacity</u>. The capacity of the multichannel system is dependent on the type equipment used (# of channels, data rate). To determine if the capacity of the various links was sufficient to accommodate projected AIS traffic, the study team had to consider projected operational traffic volume and subtract that from link availability. In determining operational volume, the LFICS Loading Analysis (reference (at)) and the Intelligence Communications (reference (zz)) Study were examined. Both of these provided inconclusive data to compare against AIS data collected by the study team. Nor was the AIS data collected considered conclusive in itself, but merely a baseline for further in depth analysis. In order to complete a comparison for this study effort, the study team researched the LFICS Study of 1971 (reference (ag)), the MCTSSA Multichannel Requirements Analysis of 1978 (reference (ar)), and the MAGTF Teleprocessing Requirements Study of 1980 (reference (ae)). These three documents based their data analysis on a Sylvania data collection effort of the Vietnam conflict completed in 1968. Each study was an update of the technical data available at the time of the study.

Tables 7-1 to 7-6 were constructed from data contained in reference (ae). They represent a "worst case" environment. Figures 7-4 through 7-6 represent specific link assignments that coincide with the links shown in tables 7-1 through 7-6. The data used from reference (ae) includes administrative/logistics voice traffic that was considered operational traffic for their analysis (e.g. casualty reporting). With the introduction of automated reporting procedures during D+5, this voice traffic would be reduced, however, since a detailed third and fourth order analysis has not been performed it is difficult to determine the percentage

of reduction. Therefore, this traffic was assumed to be present for our analysis on D+5 and D+11 also. Tables 7-1 to 7-6 measure availability in traffic units. One traffic unit is the equivalent of one channel. Once the channel availability is known, that can be converted to kilobits based on the data rate capability of the equipment. For example, a 1200 Bps channel can accommodate 1200 x 60 seconds x 60 minutes x 24 hours = 103,680 Kb per day. Conversely, knowing the Kb per day requirement and data rate capability of the equipment you can determine the number of channels required to handle the requirement. Tables 7-7 through 7-9 depict daily AIS transfer requirements in Kb per day over these same links. These figures are derived from actual usage data collected during this study and shown in table 7-10.

The manpower data is based on actual MMROP populations and the number of transactions per man per month. The logistics data is based on a representative number of transactions entered by units over a 30 day period.

TABLE 7-1. MULTICHANNEL AVAILABILITY
D-DAY

LINK NO.		COMMON USER TRAFFIC UNITS AVAIL	TRAFFIC UNITS LFICS	TRAFFIC UNITS AVAIL FOR AIS
1	MAF-EXT	0	0.98	-0.98
2	MAF-DIV	1	5.53	-4.53
3	MAF-WING	3	2.03	0.97
4	DIV-TAE	5	*	
5	DIV-FSSG (LFSP)	7	19.38	-12.38
6	DIV-ART	3	14.35	-11.35
7	DIV-IRT	3	6.85	-3.85
8	ART-ABN	4	3.47	0.53
9	IRT-ABN	4	0.40	3.60
10	MAF-TAE	0	*	
11	MAW-DIV	0	3.80	-3.80
12	ALT MAW-MACS (TAE)	16	*	
13	ALT MAW-MAG (TAE)	18	5.15	12.85
14	MACS-LAAMBN (TAE)	5	*	
15	MAF-FSSG	0	1.77	-1.77
16	FSSG-MAW	0	0.72	-0.72
17	ALT MAW-MWSG (TAE)	5	*	
18	MAG-MWSG (TAE)	5	*	
19	MAG-MACS (TAE)	4	*	
20	DIV-EXT	0	2.30	-2.30

*No data available from LFICS study.

TABLE 7-2. MULTICHANNEL AVAILABILITY
D+5

LINK NO.		COMMON USER TRAFFIC UNITS AVAIL	TRAFFIC UNITS LFICS	TRAFFIC UNITS AVAIL FOR AIS
1	MAF-EXT	2	0.98	1.02
2	MAF-DIV	17	5.53	11.47
3	MAF-WING	16	2.03	13.97
4	DIV-TAE	0	*	
5	DIV-FSSG (LFSP)	7	19.38	-12.38
6	DIV-ART	3	14.35	-11.35
7	DIV-IRT	3	6.85	-3.85
8	ART-ABN	4	3.47	0.53
9	IRT-ABN	4	0.40	3.60
10	MAF-TAE	5	*	
11	MAW-DIV	14	3.80	10.20
12	MAW-MACS	16	*	
13	MAW-MAG	18	5.15	12.85
14	MACS-LAAMBN	5	*	
15	MAF-FSSG (LFSP)	6	1.77	4.23
16	FSSG-MAW	0	0.72	-0.72
17	ALT MAW-MWSG (TAE)	5	*	
18	MAG-MWSG (TAE)	5	*	
19	MAG-MACS	4	*	
20	DIV-EXT	0	2.30	-2.30

*No data available from LFICS study.

TABLE 7-3. MULTICHANNEL AVAILABILITY
D+11

LINK NO.		COMMON USER TRAFFIC UNITS AVAIL	TRAFFIC UNITS LFICS	TRAFFIC UNITS AVAIL FOR AIS
1	MAF-EXT	2	0.98	1.02
2	MAF-DIV	17	5.53	11.47
3	MAF-WING	16	2.03	13.97
4	DIV-TAE	0	*	
5	DIV-FSSG	3	19.38	-16.38
6	DIV-ART	3	14.35	-11.35
7	DIV-IRT	3	6.85	-3.85
8	ART-ABN	4	3.47	0.53
9	IRT-ABN	4	0.40	3.60
10	MAF-TAE	5	*	
11	MAW-DIV	14	3.80	10.20
12	MAW-MACS	16	*	
13	MAW-MAG	18	5.15	12.85
14	MACS-LAAMBN	5	*	
15	MAF-FSSG	30	1.77	28.23
16	FSSG-MAW	5	0.72	4.28
17	ALT MAW-MWSG (TAE)	5	*	
18	MAG-MWSG (TAE)	5	*	
19	MAG-MACS	4	*	
20	DIV-EXT	0	2.30	-2.30

*No data available from LFICS study.

TABLE 7-4. MULTICHANNEL AVAILABILITY
D-DAY (MTACCS)

LINK NO.		COMMON USER TRAFFIC UNITS AVAIL	TRAFFIC UNITS LFICS	TRAFFIC UNITS AVAIL FOR AIS
1	MAF-EXT	0	0.98	-0.98
2	MAF-DIV	1	5.53	-4.53
3	MAF-WING	2	2.03	-0.03
4	DIV-TAE	5	*	
5	DIV-FSSG (LFSP)	7	19.38	-12.38
6	DIV-ART	3	14.35	-11.35
7	DIV-IRT	3	6.85	-3.85
8	ART-ABN	4	3.47	0.53
9	IRT-ABN	4	0.40	3.60
10	MAF-TAE	0	*	
11	MAW-DIV	0	3.80	-3.80
12	ALT MAW-MACS (TAE)	24	*	
13	ALT MAW-MAG (TAE)	26	5.15	20.85
14	MACS-LAAMBN	5	*	
15	MAF-FSSG	0	1.77	-1.77
16	FSSG-MAW	0	0.72	-0.72
17	ALT MAW-MWSG (TAE)	5	*	
18	MAG-MWSG (TAE)	5	*	
19	MAG-MACS (TAE)	4	*	
20	DIV-EXT	0	2.30	-2.30

*No data available from LFICS study.

TABLE 7-5. MULTICHANNEL AVAILABILITY
D+5 (MTACCS)

LINK NO.		COMMON USER TRAFFIC UNITS AVAIL	TRAFFIC UNITS LFICS	TRAFFIC UNITS AVAIL FOR AIS
1	MAF-EXT	2	0.98	1.02
2	MAF-DIV	25	5.53	19.47
3	MAF-WING	25	2.03	22.97
4	DIV-TAE	0	*	
5	DIV-FSSG (LFSP)	7	19.38	-12.38
6	DIV-ART	3	14.35	-11.35
7	DIV-IRT	3	6.85	-3.85
8	ART-ABN	4	3.47	0.53
9	IRT-ABN	4	0.40	3.60
10	MAF-TAE	5	*	
11	MAW-DIV	22	3.80	18.20
12	MAW-MACS	24	*	
13	MAW-MAG	26	5.15	20.85
14	MACS-LAAMBN	5	*	
15	MAF-FSSG (LFSP)	6	1.77	4.23
16	FSSG-MAW	0	0.72	-0.72
17	ALT MAW-MWSG (TAE)	5	*	
18	MAG-MWSG (TAE)	5	*	
19	MAG-MACS	4	*	
20	DIV-EXT	0	2.30	-2.30

*No data available from LFICS study.

TABLE 7-6. MULTI-CHANNEL AVAILABILITY
D+11 (MTACCS)

LINK NO.		COMMON USER TRAFFIC UNITS AVAIL	TRAFFIC UNITS LFICS	TRAFFIC UNITS AVAIL FOR AIS
1	MAF-EXT	2	0.98	1.02
2	MAF-DIV	25	5.53	19.47
3	MAF-WING	25	2.03	22.97
4	DIV-TAE	0	*	
5	DIV-FSSG	3	19.38	-16.38
6	DIV-ART	3	14.35	-11.35
7	DIV-IRT	3	6.85	-3.85
8	ART-ABN	4	3.47	0.53
9	IRT-ABN	4	0.40	3.60
10	MAF-TAE	5	*	
11	MAW-DIV	22	3.80	18.20
12	MAW-MACS	24	*	
13	MAW-MAG	26	5.15	20.85
14	MACS-LAAMBN	5	*	
15	MAF-FSSG	39	1.77	37.23
16	FSSG-MAW	4	0.72	3.28
17	ALT MAW-MWSG (TAE)	5	*	
18	MAG-MWSG (TAE)	5	*	
19	MAG-MACS	4	*	
20	DIV-EXT	0	2.30	-2.30

*No data available from LFICS study.

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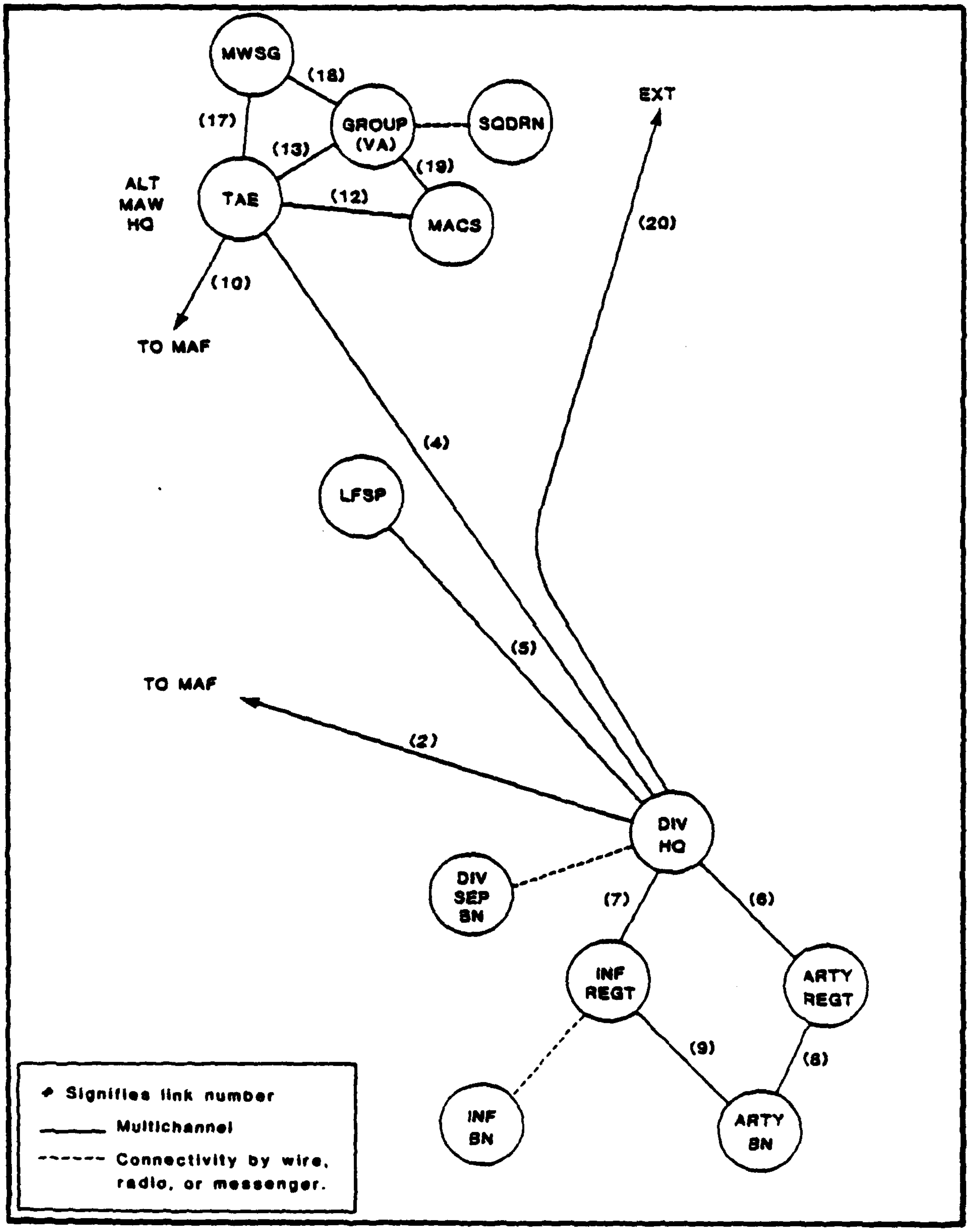

Figure 7-4. Multichannel Links D-Day

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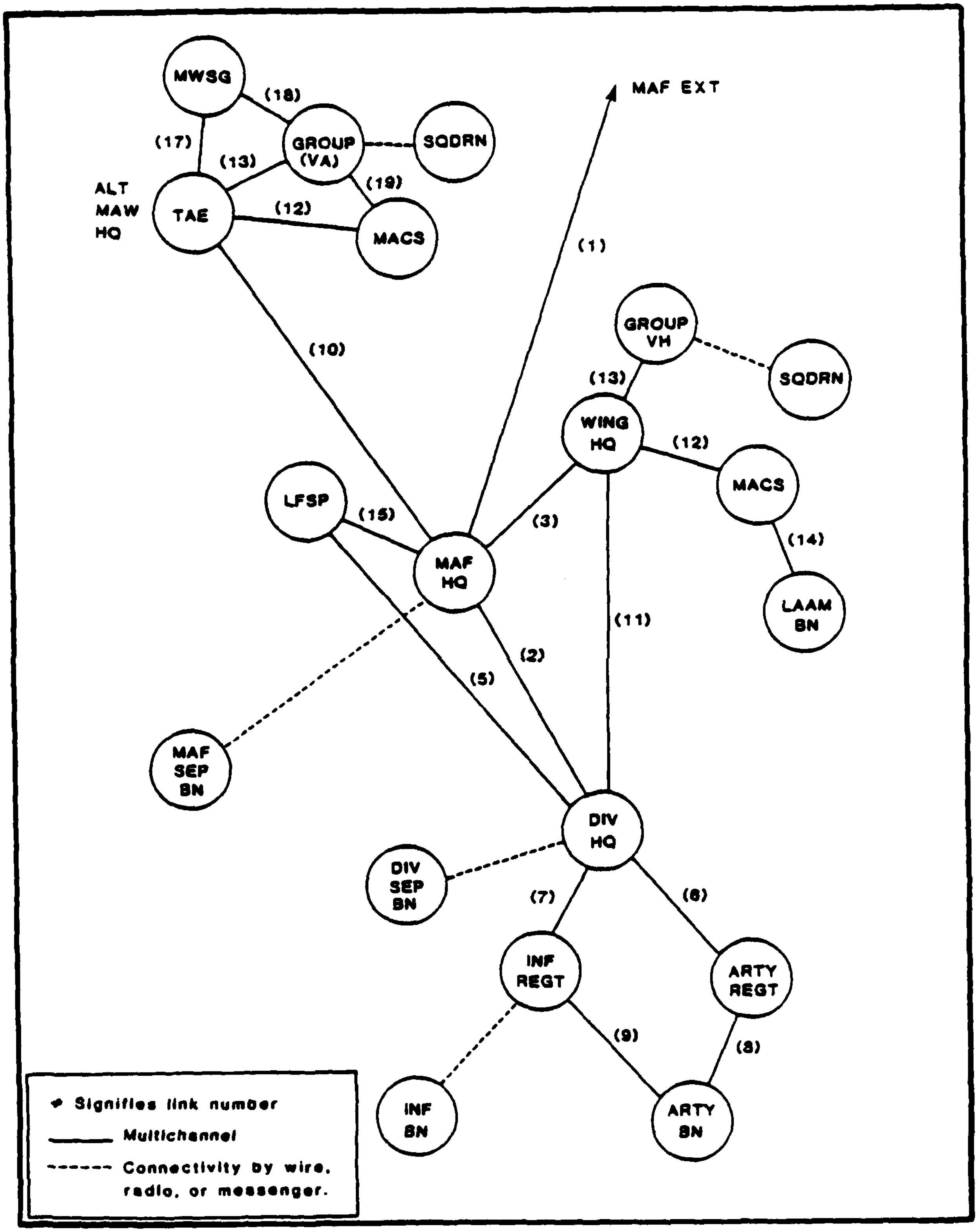

Figure 7-5. Multichannel Links D+5

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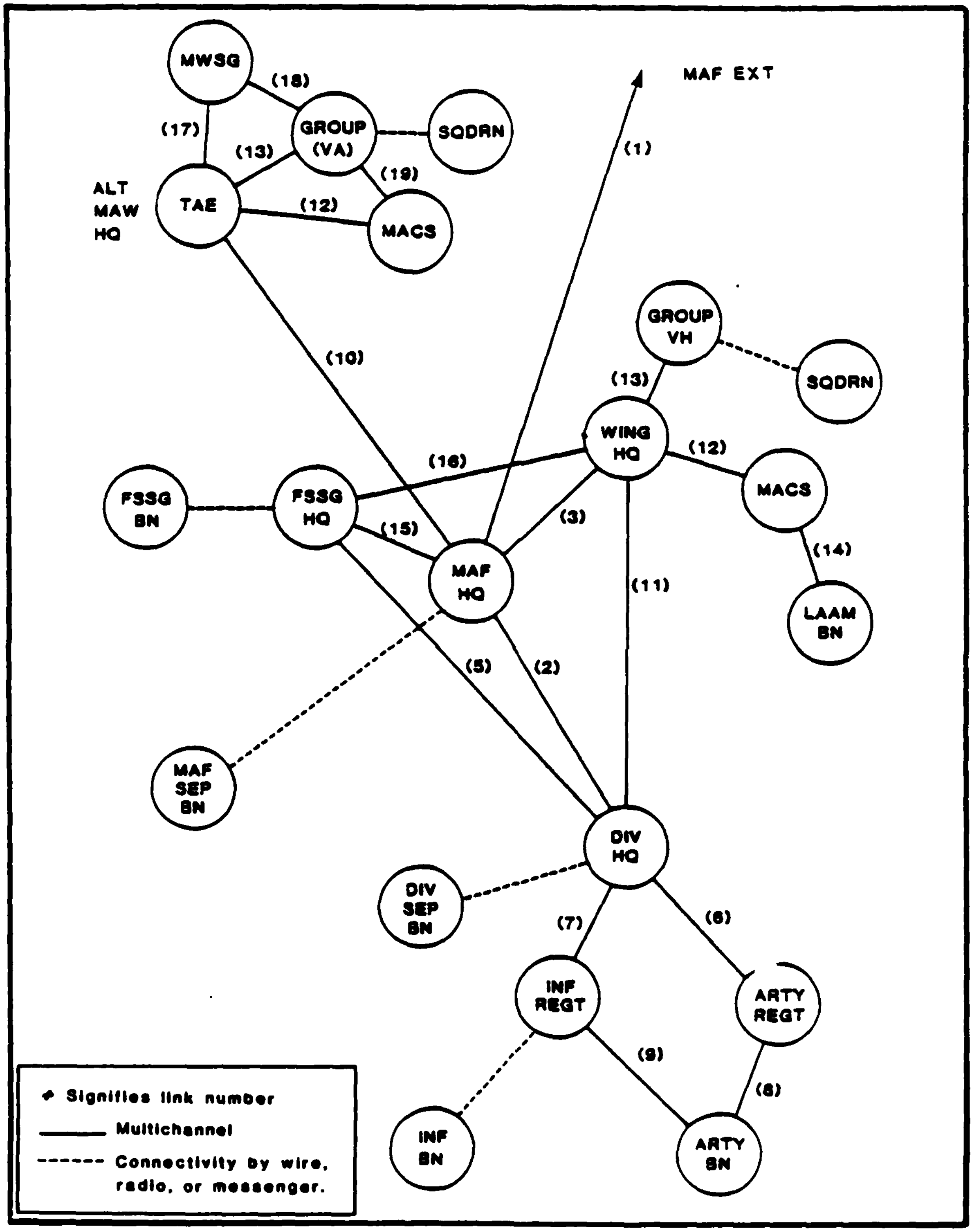

Figure 7-6. Multichannel Links D+11

TABLE 7-7. AIS DATA TRANSFER REQUIREMENTS

D-DAY

LINK		KBPS/DAY
2	DIV-MAF	14955.0
4	DIV-TAE	NONE
5	DIV-LFSP	NONE
6	ART-DIV	5874.0
7	IRT-DIV	1298.0
8	ABN-ART	914.0
9	ABN-IRT	NONE
10	MAF-TAE	14994.0
12	MACS-ALT MAW	310.0
13	MAG-ALT MAW	5636.0
17	MWSG-ALT MAW	668.0
18	MAG-MWSG	3578.0
19	MACS-MAG	NONE
20	DIV-EXT	NONE

TABLE 7-8. AIS DATA TRANSFER REQUIREMENTS

D+5

LINK		KBPS/DAY
1	MAF-EXT	41593.4
2	DIV-MAF	14955.0
3	MAF-MAW	6668.0
5	DIV-LFSP	NONE
6	ART-DIV	5874.0
7	IRT-DIV	1298.0
8	ABN-ART	914.0
9	ABN-IRT	NONE
10	MAF-TAE	14994
11	DIV-WING	NONE
12	MACS-MAW	310.0
13	MAG-MAW	5636.0
14	LAAMBN-MACS	416.0
15	LFSP-MAF	593.4

TABLE 7-9. AIS DATA TRANSFER REQUIREMENT

D+11

LINK		KBPS/DAY
1	MAF-EXT	*109107
2	DIV-MAF	14955
3	MAW-MAF	7236
5	DIV-FSSG	(a)NONE (14955)
6	ART-DIV	5874
7	IRT-DIV	1298
8	ABN-ART	914
9	ABN-IRT	NONE
10	TAE-MAF	14994
11	DIV-MAW	NONE
12	MACS-MAW	310
13	MAG-MAW	5636
14	LAAMBN-MACS	416
15	FSSG-MAF	67372
16	MAW-FSSG	(b)NONE (7236)
17	MWSG-ALT MAW	668
18	MAG-MWSG	3578
19	MACS-MAG	NONE

(a) Figures included in DIV-MAF link (2)

(b) Figures included in MAW-MAF link (3)

*This figure includes MAF total requirement for logistics and manpower (SASSY/MIMMS and JUMPS/MMS). Because of fragmentation of units into detachments, the exact totals over all links in the network cannot be arrived at.

TABLE 7-10. DAILY DATA TRANSFER REQUIREMENTS
BY SYSTEMS IN KB/S

UNIT	MANPOWER	LOGISTICS	TOTAL
MAF HQ	109.8	183.4	293.2
COMM BN	160.3	753.6	913.9
RADIO BN	95.8	214.1	309.9
DIV HQ	288.5	753.6	1042.1
INF REGT	566.5	731.7	1298.2
RECON BN	87.5	183.4	270.9
CBT ENGR BN	183.0	303.0	486.0
TANK BN	192.1	643.0	835.1
A AMPHIB BN	237.7	643.0	880.7
LAV BN	194.0	643.0	837.0
ARTY REGT	816.4	5057.6	5874.0
MAW HQSQDRN	122.2	183.4	305.6
MWSG	181.4	486.4	667.8
MACG	485.7	2904.0	3389.7
MAG	602.7	3577.6	4180.3
FSSG	2015.0	9676.8	11691.8
ACU	3840.0	-	3840.0
SMU	-	20320.0	20320.0
MMU	-	31520.0	31520.0
TOTALS	10178.6	78777.6	88956.2

7.3.3 D-Day Support. Administrative/logistics traffic during the initial stages of the operation would not be automated within the AOA. Until the multichannel system is established ashore, this type of traffic will be via voice radio or courier. Upon establishment of the multichannel system, AIS traffic can be assumed to be building up. Since AIS traffic builds concurrently with the buildup of forces ashore, single channel radio and courier will be adequate to handle this traffic with prior planning. For the purposes of this study D+5 was determined to be the initial stage of multichannel usage.

The TAE units can be assumed to be transmitting via multichannel during the entire D-Day to D+5 time frame. Internal AIS traffic can readily be accommodated over the established links since traffic for internal units is minimal when compared to common user availability. However, external AIS communications requirement is extensive (17,860 kb/day). This is beyond the capability of a dedicated AN/TSC-95 link. An alternate path would be via Division over AN/TSC-93 to MAF aboard ship via AN/MRC-135. While theoretically this could absorb the AIS requirement, it is considered impractical. A more viable solution would be to establish an AN/TSC-96 link from TAE to external. This is reflected in the system proposed in Section 6. (See figure 6-13).

7.3.4 D+5 Support. On D+5 MAF is established ashore. Figures 6-4 and 6-14 depict the multichannel network envisioned for the D+5 to D+11 time span. Of particular note is the AN/TSC-85 to AN/TSC-93 links. These links add considerable data capability between senior Marine headquarters and also provide a means for entry into the DCS network. The TAE retains its capability for external entry through the AN/TSC-96. An AN/TSC-96 link is also established for MAF to external. The only capability deficiency

existing on D+5 would be between the division and its subordinate regiments in the pre- MTACCs era. Analysis indicates that dual AN/MRC-135 links would be required to handle the combined operational and AIS traffic load. Realigning AN/MRC-135 assets within the MAF would permit dual assignment, however, it would reduce reserve assets to 12% overall. Introduction of the AN/MRC-139 in the MTACC era increases the throughput capacity to 16 kb/s per channel. This will alleviate the problem.

7.3.5 D+11 Support. On D+11 FSSG is established ashore. At this point in time the system control units (ACU, SMU, MMU) are collocated with FSSG headquarters. The DFASC is also operational at FSSG. The Division to FSSG link established is saturated, however, alternate routing via MAF is considered a viable solution to this problem. The shortfalls between Division and subordinate regiments still exist in the pre MTACCs era on D+11.

7.3.6 Single Channel Radio Availability. The single channel radio system provides a secondary means of transferring AIS data within the AOA. It should be considered as an alternative when and where the multichannel system is not available. Its primary use in this scenario is to manually transmit AIS information between forward elements, without their organic ADPE-FMF assets during assault phases, and the AIS system control unit. The DCT could be used for this purpose and would serve to extend the AIS capability down to the maneuver unit level.

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SECTION 8. CONCLUSIONS AND RECOMMENDATIONS

This section presents the findings of the study by discussing the specific task assignments based on the statement of work, drawing conclusions based on the study report and related research and recommending courses of action to be taken. There are fourteen separate conclusions and recommendations presented herein.

8.1 Automated Information System Operational Facilities

8.1.1 Summary. Electrospace as part of this study effort, delivered to the Marine Corps on 6 August 1985 a separate report, "Automated Information Systems Operational Facilities, Definition Report." That report described AIS Operational Facilities (AISOPFACS) that would deploy and function in the AOA along with tactical operational facilities. AISOPFAC definitions are included in section 4 of this report.

8.1.2 Conclusion. TDSs, AISs and other communications requirements such as voice and facsimile must all share the same LFICS communications network. These requirements must be considered in their aggregate in order to make accurate evaluations of their combined impact on the network. Common units of measurement and standard methods of configuration, quantifying traffic loads and sizing of other communications phenomena are mandatory in order to design the complete network and accurately measure the effect of changes. The identification of AISOPFACs and their information exchange requirements is a key step towards a standard configuration and lets the planner consider AISs and TDSs on a common basis with the other communications needs. This common denominator approach also permits the development of a single data base to support TDS, AIS and other systems development, sizing, configuration and modeling of the communications network, war gaming and training.

8.1.3 Recommendations. The Marine Corps should adopt the concept of AISOPFACs, include them as part of their documentation in the TIC and the TIDP and consider their information exchange requirements in the future LFICS architecture modifications.

Additionally, AIS system developers should consider these OPFACs and their information exchange requirements in their Telecommunications Support Plans. FMF units should also employ AISOPFACs with supporting EUC equipment in field training exercises to refine concepts of operation and help develop SOPs, including manual fall-back procedures, that will enhance ADP/communications operations.

8.2 Information Flow Using Multiple Agency Sequence Diagrams (MASDs)

8.2.1 Summary. Top level MASDs were developed for each major deployable AIS. These appear and are discussed in section 4 of this report. They include the AIS, the OPFACs it supports, the outside agencies that receive class I information, and the TDS OPFAC and TDS it interfaces with. Diagrams are provided for both pre-MTACCs and MTACCs eras.

8.2.2 Conclusion. MASDs provide a structured method for determining information flow and exchange requirements. Extensive development of MASDs for TDSs has been accomplished for applicable areas of warfare listed in JCS Pub 12 and are presented in the TIDP. This concept is equally applicable to AISs.

8.2.3 Recommendation. The MASDs appearing in section 7 should be incorporated in the TIDP. Continued development of these MASDs is recommended as AIS systems are redesigned to include MAGTF requirements. This should be done for each applicable area of warfare in JCS Pub 12.

8.3 AISOPFAC Information Flow Requirements

8.3.1 Summary. Information flow requirements are initially determined by the overall architecture and concept of operation of the Marine Corps AIS structure and how it supports deployed units. Within a MAGTF in an AOA, the flow requirements are further derived from a broad combination of factors. Some of the key determinants are AIS function, concept of operation, location, time of landing and required information sharing.

Initial estimates of information flow requirements can be made on the basis of force structure, troop population and experience with like systems. This is usually accomplished by systems engineers in the design phase and is preferably done with a communications traffic simulation computer model. The second order of estimation should be based on actual operation of the system or prototype in an exercise mode with data collection designed to verify or adjust the initial modeling results.

8.3.2 Conclusion. AIS information flow requirements are defined in section 4 through 7 in the form of multiple agency sequence diagrams, communications needlines, communications flow lines, bits per day, traffic units and channel availability. This constitutes the initial estimates which were derived manually in this and other analyses. There is no evidence that the estimates have been verified through either computer models or actual operations. Since actual and prototype systems already exist, the initial estimates can be verified through repetitive tests in the form of operational exercises.

8.3.3 Recommendations. AIS functional sponsors and users should initiate this testing cycle by development of Telecommunications Support Plans (TSP) as required in MCO P5231.1 and subsequent use of the available systems in both special and regularly scheduled exercises. Both the TSPs and exercise plans should stress traffic data collection and analysis. Concurrently,

consideration should be given to a computer modeling capability as discussed in paragraph 8.12.

8.4 Communications Needlines and Flowlines for AIS and TDS Traffic

8.4.1 Summary. Communications needlines for AIS traffic were developed from the MASDs in section 4 and are displayed in appendix C of this report. Needlines for TDS systems are contained in the TIDP. Once the needlines were developed and analyzed and applied to the scenario, flowline diagrams were developed based on the OPFAC and AISOPFAC locations. These are contained in section 7 of this report. These flowline diagrams identify points of coexistence for AIS and TDS information. Points of intersection occur at all nodes and are explained in more detail in the MASDs and in paragraph 8.5.

8.4.2 Conclusion. AIS and TDS traffic exist at virtually all levels of command. Communications can accommodate both types with minor exceptions, as discussed in sections 5 and 6 of this report.

8.4.3 Recommendation. The LFICS architecture should continue to be developed and refined based on total AIS and TDS communications requirements.

8.5 Information Exchange Requirements Between TDS OPFACs and AISOPFACs

8.5.1 Summary. The AIS's that would be deployed were first verified, then identified with their appropriate AISOPFACs in this study. AISOPFAC and TDS OPFAC relationship and interface matrices were then drawn. MASDs were developed that displayed the information exchange requirements between the AISOPFACs and TDS OPFACs. These relationships are shown in section 4 and support the needlines and flowlines developed in section 7. Their information exchange requirements were then described by the MAGTF Data Transfer Plan developed in sections 5, 6, and 7.

8.5.2 Conclusion. Information exchange requirements exist between TDS and AISOPFACs at virtually every echelon in the MAGTF. Deployable AISs can satisfy MAGTF information, including selected TDS requirements, if properly planned for prior to the amphibious operation.

8.5.3 Recommendations. More accurate definition of TDS and AISOPFAC information exchange requirements should be developed. This can be done in the following ways:

- More detailed MASDs included in the TIDP.
- Developing AIS concepts of employment.
- Develop SOPs and operations plans with the appropriate annexes to support EUCE and AIS use in combat. Exercise them for verification, improvement and training.

8.6 Optimum Equipment Suite for End User Data Transfer Processing

8.6.1 Summary. The optimum equipment suites for AIS and TDS data transfer requirements for the study scenario are described in sections 5, 6 and 7 of this report.

8.6.2 Conclusion. The current and planned FMF communications assets are sufficient to support the optimum equipment suite developed for the study scenario with the exception of medium-range, multichannel equipment capacity in the near term.

In the near term, the AN/MRC-135 channel capacity from Division to subordinate regiments is insufficient to handle operational and administrative/logistics traffic. Section 7 of this report depicts this shortfall on a unit by unit basis.

8.6.3 Recommendations. In order to accommodate the projected operational traffic between Division and regiments, additional channels are required. Reference (zz) recommended establishment of ten additional links for a MAF. Our analysis supports these findings. Applying a European intense combat active factor of .13 would indicate that an increase of 23 AN/MRC-135s are required to satisfy ten additional links.

Between 1989 and 1992, prior to the AN/MRC-139 introduction, the AN/TTC-42 and SB-3865 digital switches will be in the Marine Corps inventory. During this period a digital capability for the AN/MRC-135 would greatly increase throughput capacity. Codalex, Ltd., the manufacturer of the AN/MRC-135, is developing a modification to the AN/MRC-135 to provide two 16 Kbps channels for digital traffic. The modification replaces one of the two current TH-81 modems with a modified version that will provide the two 16 Kbps channels in place of four voice channels. This modification has been demonstrated successfully at MCDEC, Quantico, Virginia. The demonstration successfully passed encrypted data between ADPE-FMF computers at a data rate of 9600 bps. The encryption device employed was the KG-84A. A detailed test of this modification should be accomplished and, if successful, pursued as a modification program. This would enhance the operational effectiveness of the AN/MRC-135 and provide a much needed data capability for medium range multichannel equipment for the near term until the AN/MRC-139 is introduced. For the far term it could provide the medium range ship-to-shore data capability that the AN/MRC-139 cannot provide.

8.7 Peripheral or Supporting User ADPE Shortfalls

8.7.1 Summary. The current version of the DFASC has two major deficiencies. An evaluation of the communications front-end-processor (FEP), conducted as a separate part of this effort, concluded that the current FEP is inadequate in terms of line capacity and protocol

capabilities. It has also been reported that the central processor is too small to handle either of the major DBMS oriented SASSY/MIMMS and JUMPS/MMS/REAL FAMMIS data bases.

The EUCE program includes a sufficient number of capable equipments. However, with the exception of the ADPE-FMF equipments, the EUCEs are being procured outside the normal acquisition process. As a result the program does not include the integrated logistic support planning necessary to assure continuing support in the field.

The ADPE-FMF and DCT devices have additional utility for applications in MAGTF AIS operations. As indicated in the DFASC FEP evaluation, the ADPE-FMF equipment can serve as a local area concentrator and significantly reduce the number of lines that the FEP has to support. The DCT, with its multiple formatted and free text input options, small size, and diverse interface capability has a significant potential in AIS applications. It would be especially useful at levels and times which preclude use of the EUCE. While administrative and logistic applications of the DCT are referred to in the C2MP and other documents, these uses have not been fully developed and documented.

8.7.2 Conclusions

- The restricted FEP and processing capabilities in the DFASC would prevent the MAGTF from deriving full benefit of the current and future capabilities of the major AISs.

- The MAGTF would not realize the full potential of the EUCE without a more structured acquisition effort and Integrated Logistic Support Plan (ILSP).

- The utility and life cycle of the ADPE-FMF equipment could be extended by incorporating it into the planning as a communications control device.

- The utility of the DCT and the MAGTF AISs would be increased by use of the DCT in selected AIS functions.

8.7.3 Recommendations

- That the MASC be upgraded to resolve the DFASC deficiencies and that the MASC and Phase 3 of the EUCE program, which is a standardization phase, be developed through a method which will assure an ILSP.

- That the communications capability of the ADPE-FMF be included in future LFICS and AIS planning.

- That procedures and software be developed for use of the DCT in MAGTF AIS operations.

8.8 Optimum and Alternative MAGTF AIS Communications Circuitry

8.8.1 Summary. The LFICS was developed for single and multichannel voice and data communications during an amphibious assault and operations ashore. Single channel radio provides the initial and back-up capability while multichannel radio is the primary means when facilities can be installed. Because of the initiatives in both LFICS and the ADPE-FMF/DFASC, the AOA communications system is capable of providing the projected AIS requirements with minor exceptions.

Section 4 develops a concept of considering AISs in the same terms as the TDSs. In the process it was determined that the two types of facilities coexist at virtually all of the major command and control nodes in the MAGTF. Therefore, normal force connectivity and circuit allocations will suffice to support most of the projected AIS requirements.

Sections 5, 6, and 7 develop circuit connectivity in detail. Additional requirements for internal circuits between division and regiments are identified in section 6. There are also requirements for ship-to-shore communications at extended over-the-horizon stand-off distances and for external circuits.

Circuits to points outside the AOA will remain at a premium through the mid-range period. Concentration of information at the DFASC for batch communications during off-peak periods serves to minimize the demand. Additionally, there is an opportunity to have the TCC modified to provide a DDN compatible X.25 packet switching capability. These measures and the capacity of MAGTF satellite communications will provide baseline external connectivity.

8.8.2 Conclusion. The MAGTF switched multichannel network, backed up by the single channel capability, is an optimum configuration of current and planned assets. Shortfalls exist in medium range multichannel channels for division to regiment and ship-to-shore circuits. External circuits could be improved by developing an X.25 capability in the TCC facility.

8.8.3 Recommendations. In addition to the employment recommendations in paragraph 8.6.3, the Marine Corps should pursue a program to provide a reliable medium range ship-to-shore capability for the MTACCS era. As an interim solution, the MRC-135 16 Kbps modification should be considered. Modifications to the TCC for X.25 external communications improvements are discussed in paragraph 8.10.

8.9. Relay and Switching Functions.

8.9.1 Summary. The switching equipment, planned and existing, discussed in section 5 is satisfactory to handle a common user switching capability for ADPE-FMF and EUC equipment. Special modems are required for dial up capability, however.

8.9.2 Conclusion. There is no current program to provide ADPE-FMF and EUC equipment with modems for common user, switched circuit interface. Dial up devices have been used in IMAF and are documented in a NOSC report, reference (ac). In addition, a multitude of commercial modems are available. Many offer special circuit conditioning and security measures as well as providing the as required, dial up connectivity.

8.9.3 Recommendation. The Marine Corps should initiate a formal program to provide dial up modems for ADPE-FMF and EUC equipment.

8.10 Compatibility Problems with Switching Equipment

8.10.1 Summary. As indicated in paragraph 8.9, the existing and planned LFICS switching equipments can provide internal AOA support. In addition, recommended changes to the DFASC FEP will make it compatible with the external packet switched DDN by addition of the X.25 protocol capability. At this time, however, there are no plans for the X.25 protocol in the TCC processors.

8.10.2 Conclusion. Lack of an X.25 protocol capability in the TCC will require dedicated transmission equipment to provide DFASC access into DDN.

8.10.3 Recommendation. The Marine Corps should initiate action to include X.25 capability in the TCC as part of a product improvement program.

8.11 Creation of Data Files for ADP Equipment and AISOPFACs

8.11.1 Summary. Data files have been developed by this study effort and are delivered under separate cover. These files will be used by C3 Division, MCDEC in the modeling effort described in paragraph 8.12.1.

8.12 A MAGTF Data Transfer Plan within Planned and Existing Equipment for Operations while Embarked or Ashore

8.12.1 Summary. This report constitutes a MAGTF data transfer plan based upon the Marine Corps 1A Scenario. It includes two eras (pre-MTACCS and MTACCS) and three time snapshots in each era. Although oriented to a specific scenario the plan is generic in application. It is built upon the doctrine, techniques and tactics used in current FMFM's and MCDEC programs of instruction.

8.12.2 Conclusion. The first LFICS study completed in 1971 by Martin Marietta Corp. emphasized the need to create a computer model that could be used as a management tool to continually update communications concepts and assist in evaluating future telecommunications systems and concepts. A decision was made to not pursue a modeling effort at that time. Since then, additional studies have been conducted on a periodic basis to update information contained in the original study because of changes in employment concepts, equipment and technology. This study is a continuation of that effort. As each study is conducted, extensive research into previous studies is required and new data is manually collected and analyzed. Two recent studies, the LFICS Loading Analysis of 1984 and the Intelligence Communications Study of 1984, pointed out the need for a continuing systems architectural effort that would eliminate periodic duplicative efforts which can't be accurately aggregated. This approach would allow for more in-depth analysis using a building block design and eliminate redundancy in future studies. Such an effort is currently underway at MCDEC. In 1985

work commenced on the development of an integrated information data base to describe the pre-MTACCs architecture based on documents such as the TIC, TIDP, C^2 Master Plan, FMF 10-1 and a variety of other sources. This data base would be comprised of a LFICS oriented architecture structured on information requirements, information exchange standards, equipment standards and standardized terms of reference and units of measurement.

The set of information requirements results from an established need to communicate between organizational facilities that form the elements of an architecture. Changes in organization, procedures, or capabilities cause changes in the set of information requirements. Doctrine interfaces with the C^4 architecture at this junction by controlling how these changes are incorporated into operational concepts.

Information exchange standards are the set of agreed upon protocols, formats, and messages that govern the exchange of information within the architectural model.

Equipment standards are developed to physically implement the exchange of information. Equipment standards are the set of characteristics needed to describe a system and the circuits it supports. They must not only account for compatibility, but also a host of environmental factors such as radio interference, the effects of propagation, etc. The completed model will provide the Marine Corps with a management tool similar to that employed, and considered essential by major communications companies and systems designers.

8.12.3 Recommendation. Continue the above effort under C^4 Division sponsorship.

8.13. Doctrinal Deficiencies

8.13.1 Summary. The analysis and field interviews indicated that several AIS doctrinal requirements need to be more fully developed and tested. They include the following:

a. DFASC/MASC and EUCE Concepts of Employment. All equipment procurements are required to have, as part of the acquisition documentation, a concept of how the equipment is going to be used. The normal course of events is for a concept of employment (COE) stated in preliminary documents such as a Mission Element Need Statement (MENS) and the Required Operational Capability (ROC). This COE then evolves with the equipment and becomes the basis for operational test and evaluation and related efforts. At this point it appears that the major AISs have well defined COE for garrison employment, limited COE for Class I inputs from deployed units and none for the deployed MAGTF commander's support. There are parallel deficiencies in COE for the DFASC/MASC and the EUCE which will be used to support the AISs.

   The MASDs, needlines and flowlines developed in this report were created using the guidance contained in FMFMs 3-1 and 4-1. FMFM 4-1 assigns responsibility for AIS planning and operations to the general/special staff sections. FMFM 3-1 identifies orders and reports which can and should be developed from information contained in AISs. By using the MASDs and connectivity diagrams as a point of departure, the system and functional sponsors and the MAGTF staffs can generate or refine the COE.

b. AISOPFACS. The AISOPFACS listed in section 4 of this study use the AISs which will deploy and function in an AOA. The identification of AISOPFACs and their information exchange

requirements in doctrinal and developmental publications will cause the planner to consider both TDSs and AISs on the same basis. This, in turn, allows for the development of a single data base to support TDS or AIS systems development, modeling of AIS/TDS communications, war gaming, and training.

c. Establishment of an ACU in the FMF. Current AISs and their replacements are being developed with the management and systems support as shown in figure 7-1. In all cases except one, the system control unit is an FMF organization. The exception is the Administrative Control Unit (ACU). FMFM 4-1 and experience indicate that an ACU is required in the AOA during extended deployments. The identification of the ACU as an AISOPFAC is based upon the ACU being deployed as a manpower focal point for casualty control, replacement support and unit diary entry. Units in the assault or at the forward edge of the battle area can be supported by the ACU which will be collocated and connected to the DFASC/MASC.

8.13.2 Conclusions

a. Concepts of employment for the DFASC/MASC and EUCE which use the AIS data bases for MAGTF command and operational control are essential to the continued development and employment of the systems.

b. Designation and use of AISOPFACs in developmental and doctrinal publications will assist in the integration of these systems and functions into the overall C4 effort.

c. A systems support activity for manpower management in the AOA is essential to the casualty control, replacement support, unit diary and other manpower functions of the MAGTF commander.

8.13.3 Recommendations

a. The AISOPFACS and related MASDs and other connectivity information developed in this study should be included in the TIC and TIDP. They should further be used as a point of departure for the initiation or refinement of COE for both the AISs and the supporting DFASC/MASC and EUCE. The COE should be used to develop and test SOPs and AIS plans in field exercises with the goal of establishing operational doctrine.

b. That a deployable systems support activity, in the form of an Administrative Control Unit, be established at the MAF level.

8.14 *Plan of Action and Milestones (POA&M)*

8.14.1 Conclusion. This study is a MAGTF Data Transfer Plan. The Marine Corps planners have and are developing the equipment that can satisfy current known data transfer requirements. Efforts are being taken to develop a more usable Information Exchange Data Base. New equipment is being considered for end users and the MASCs. New AIS concepts are being developed. TDS and AIS hardware and software interchanges are being recognized (IMAF data exchange efforts and the TCO test bed are two examples). All of these activities are under different sponsorship in Headquarters Marine Corps. The mechanism is available through the use of this plan and upon approval of the recommendations contained herein to tie all of these actions into an acquisition plan to insure its accomplishment. This requires the horizontal recognition and alignment of tasks in CCA, CCI, and CCT with the efforts at the C^3 Division at the Marine Corps Development Center. Increased emphasis and standardization of telecommunication support planning of AIS's by the system developers is also required.

8.14.2 Recommendations. It is recommended that the conclusions and recommendations contained in this section be approved. Table 8-1 list 14 required actions and suggested milestone dates, based on the conclusions of this study, that should be accomplished to enhance MAGTF data transfer during the 1986-1996 time frame.

EVENT	86 Q1	86 Q2	86 Q3	86 Q4	87 Q1	87 Q2	87 Q3	87 Q4	88 Q1	88 Q2	88 Q3	88 Q4	89 Q1	89 Q2	89 Q3	89 Q4
AIS OPFAC IMPLEMENTATION		△														
AIS MASD DEVELOPMENT			△				△									
AIS COE UPDATE					△				△							
AIS TELECOM SUPPORT PLAN UPDATE						△				△						
AIS SOPS			△							CONTINUOUS						
AIS ANNEX TO OPORD	△									CONTINUOUS						
AN/MRC-135 PROCUREMENT		△				△										
AN/MRC-135 MOD						△							△			
MASC/EUCE ACQUISITION PLANS		△				△										
DCT APPLICATION DEVELOPMENT AND TEST		△			△ DEVELOPMENT				△ TEST							
ADPE-FMF COMMUNICATION INTERFACE OPERATIONAL HANDBOOKS			△			△										
DIAL-UP MODEM ACQUISITION			△												△	
TCC X.25 PRODUCT IMPROVEMENT		△								△						
ACU IN THE FMF		△		△												
INCLUSION OF AIS IN FUNCTIONAL C3 ARCHITECTURE MODEL		△								△ CONTINUOUS USE TO SUPPORT THE MAGTF DATA TRANSFER PLAN.						

Table 8-1. POA+M

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APPENDIX A

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APPENDIX B

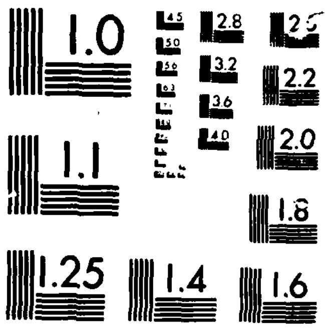
LANDING SCHEDULE

LANDING SCHEDULE

UNIT	TIME	LOCATION
RLT A	D-DAY	LZ
RLT B	D-DAY	LZ
RLT C	D-DAY	BEACH
BLT A	D-DAY	LZ
RECON BN	D-DAY	WITH RLT A RLT B BN (-) WITH DIV
HQ BTRY ARTY REGT	D-DAY+1	ON CALL
DS BN ARTY	D-DAY	RLT A
DS BN ARTY	D-DAY	RLT B
DS BN ARTY	D-DAY	RLT C
GS BN ARTY	D-DAY+1	BEACH OR LZ
GS BN ARTY	D-DAY+1	BEACH OR LZ
(2) TK BN	D-DAY	RLT C/BEACH
ASSAULT AMPHIB BN	D-DAY	WITH SURFACE RLT AND BLT BN (-) WITH SP
CBT ENGR BN	D-D+2	CO'S WITH RLT'S BN (-) WITH LFSP
MAR DIV HQ	D+1+2	BEACH OR LZ
HQ BN MAR DIV	D-D+2	BEACH OR LZ
FOR RECON CO	D-DAY	FORCE BEACH HEAD
HQ MAF	D+5+6	BEACH/LZ
H&S CO MAF	D+5+6	BEACH/LZ
RADIO BN	D+4+6	BEACH OR LZ
(3) SSCT	D+5+6 ONE ON D-DAY WITH DIV HQ	BEACH OR LZ
UNIT	TIME	LOCATION
(4) CI TMS	D+8	BEACH OR LZ

AD-A167 908 MAGTF (MARINE AIR GROUND TASK FORCE) DATA TRANSFER ALTERNATIVES (1986-1996)(U) ELECTROSPACE SYSTEMS INC ARLINGTON VA APR 86 M00027-84-D-0033 4/4

UNCLASSIFIED F/G 17/2 NL



MICROCOP' CHART

TOPO PLAT	D+8	BEACH OR LZ
COMM BN	D-D+6	DET'S WITH RLTs AND DIV, BN (-) WITH MAF HQ.
CIV AFF GRU	D+8	BEACH OR PORT
HQ MAW	D+5+6	BEACH OR LZ
MW HQ SQDRN	D+5+6	BEACH OR LZ
H&HS, MACG	D+5+6	BEACH OR LZ
MACS	D+4+6	BEACH OR LZ
MACS	D-Day	THEATER AIRFIELD ECHELON (TAE)
MASS	D-DAY+2	BEACH OR LZ
HQ LAAM BN (H&S BTRY)	D+5+6	BN (-) BEACH/PORT
(2) LAAM BTRY	D-DAY	BEACH/TAE
LAAM BTRY	D+4	BEACH
LAAM BTRY	D+4	BEACH OR PORT
LAAM BTRY	D+5	BEACH OR PORT
FAAD BTRY	D-DAY	WITH RLTs
MWCS	D+4+5	BEACH OR PORT
MATCS (-)	D-DAY	TAE
MWSG	D-DAY D+5	TAE WING LSE GRP (-) BEACH OR PORT AOA
MAG (VF/VA) 5 AV-8B SQDRNS	D-DAY	TAE
MAG (VF/VA) 6 F-4 or F-18 SQDRNS	D-DAY	TAE
MAG (VF/VA) (AW) 4 A-6E SQDRNS	D-DAY	TAE
UNIT	TIME	LOCATION
MAG (VH)	D+4+5	ASHORE AOA
MAG (VH)	D-DAY-D+11	AFLOAT
VMFP (7RF-4)	D-DAY	TAE
VMAQ (15 EA-6B)	D-DAY	TAE

(2) VMGR (12 KC-130)	D-DAY	TAE
H&S BN FSSG	D-DAY+6	DETS WITH LFSP AND HSTs
SUP BN, FSSG	D-D+8	DETS WITH LFSP HSTs BN (-) WITH AFOE
MAINT BN, FSSG	D-D+8	DETS WITH LFSP HSTs; BN (-) AFOE
MT BN, FSSG	D-D+3	DETS WITH LFSP HSTs (BN(-) ON CALL)
ENGR SPT BN, FSSG	D-D+4	DET WITH LFSP: BN (-) ON CALL
LDG SPT BN, FSSG	D-D+1	DETS WITH HSTs; DET B AND P OPS CO WITH THEATER AIRFIELD ECHELON. BN (-) BEACH/PORT ON CALL
MED BN, FSSG	D-D+8	DETS WITH LFSP HSTs' BN (-) BEACH OR PORT HOSP CO AFOE
DENT BN, FSSG	D+8	BEACH/PORT AFOE
LAV BN, DIV	D-DAY	1 CO WITH EACH RLT BN (-) WITH DIV HQ
TGT AC BTRY, ARTY REGT	D-DAY	BEACH

UNITS ASHORE D-DAY AOA

RLT A
RLT B
RLT C
BLT A
RECON BN

HQ BTRY ARTY REGT
DS BN ARTY
DS BN ARTY
DS BN ARTY
GS BN ARTY
GS BN ARTY
TARGET AC BTRY
TANK BN
ASSAULT AMPHIB BN
COMBAT ENGR BN
DIV HQ
HQBN, MAR DIV
FORCE RECON CO
LAV BN

LDG SPT BN
FAAD BTRY
MASS

UNITS ASHORE D-DAY TAE

HQ, MAW (DET)

MACS

(2) LAAM BTRY

MATCS (-)

MWSG (-)

MAG (VF/VA)

MAG (VF/VA)

MAG (VF/VA) (AW)

VMAQ

(2) VMGR

FSSG (DET)

VMFP

ADDITIONAL UNITS ASHORE D+5

HQ MAF + HQTRS CO MAF

RADIO BN (-)

(2) SSCT

COMM BN (-)

HQ MAW (-)

MW HQ SQDRN

H&HS MACG

MACS

LAAM BN (-)

MWCS (-)

MATCS (DET)

MAG (VH)

MT BN, FSSG (-)

ENGR SPT BN (-)

ADDITIONAL UNITS ASHORE D+11

(4) CI TEAMS

TOPO PLATOON

CIV AFF GRU

SUP BN, FSSG (-)

MAINT BN, FSSG (-)

MED BN, FSSG (-)

DENTAL BN, FSSG (-)

HQ FSSG (-)

H&S BN, FSSG

APPENDIX C

AIS NEEDLINE DIAGRAMS

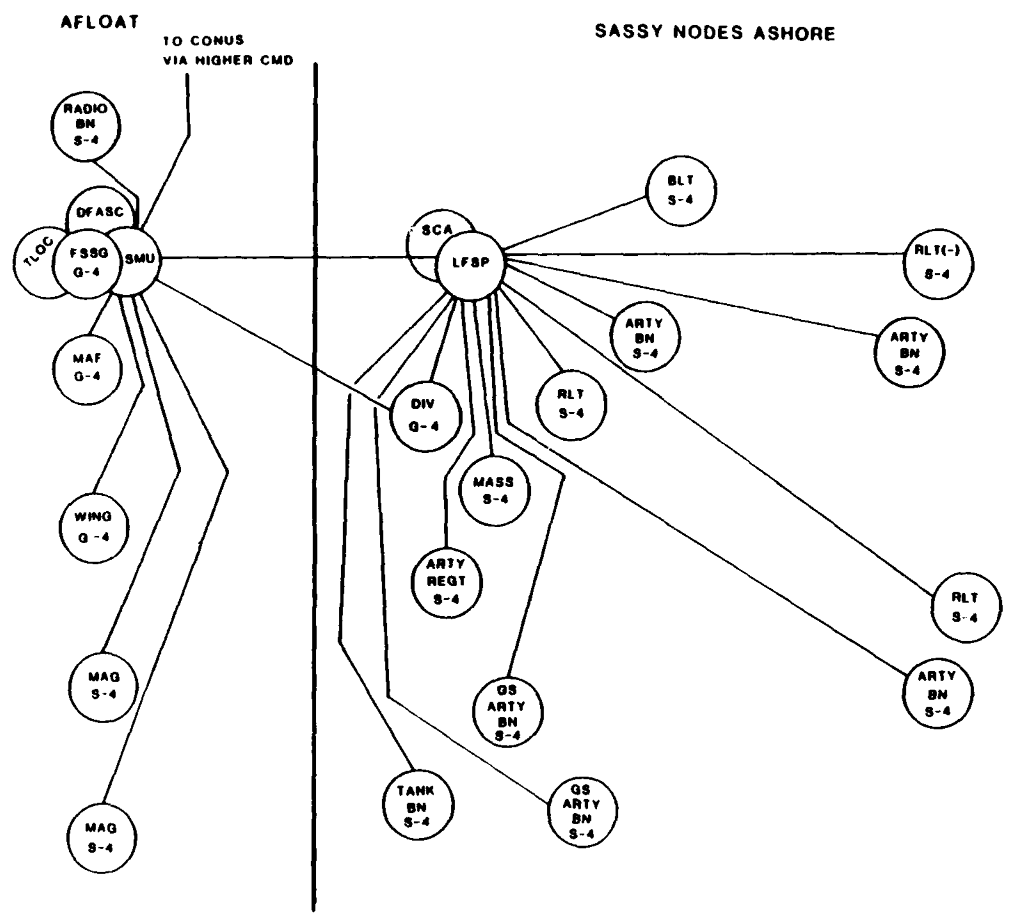


Figure C-1. SASSY Nodes D-Day (AOA)

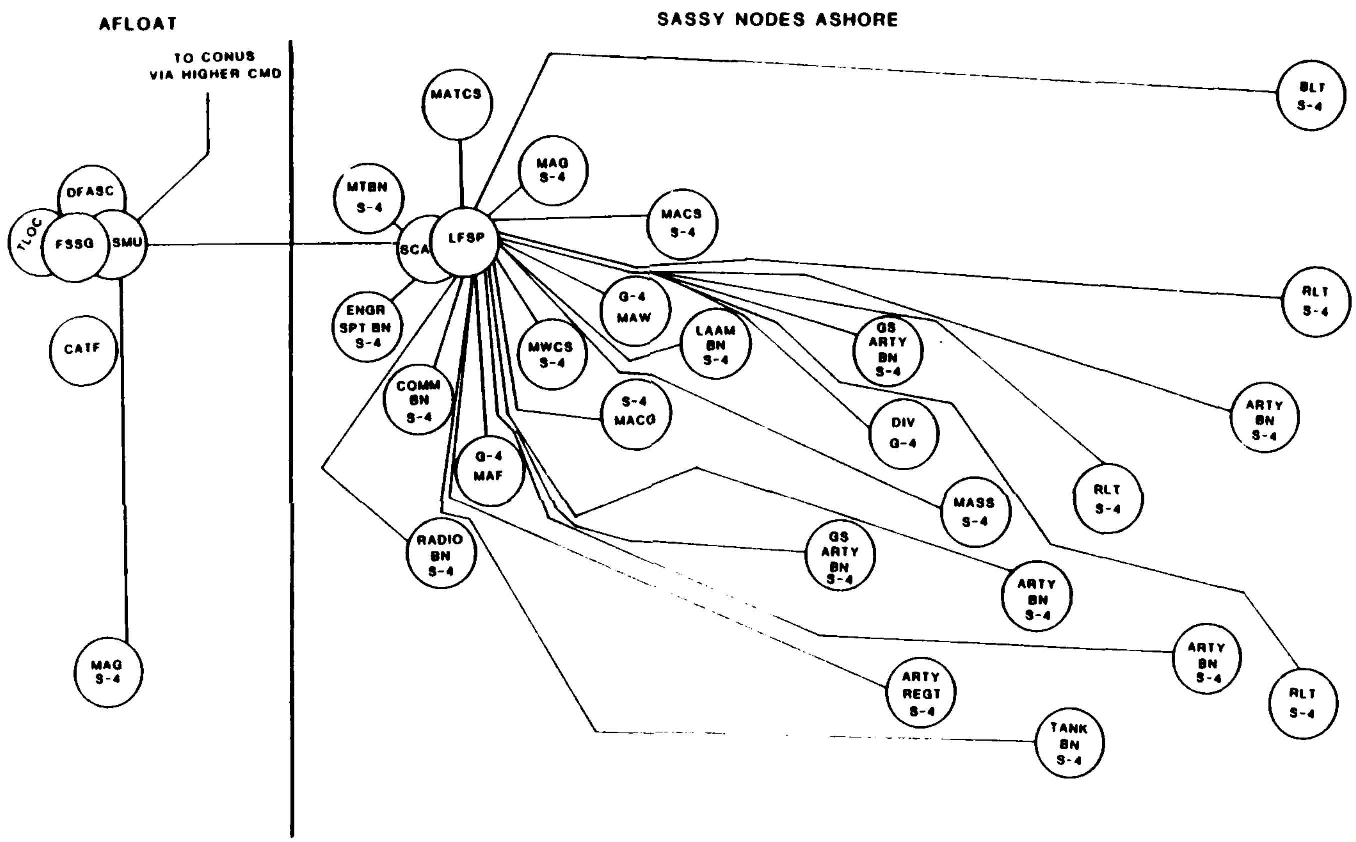


Figure C-2. SASSY Nodes D+5 (AOA)

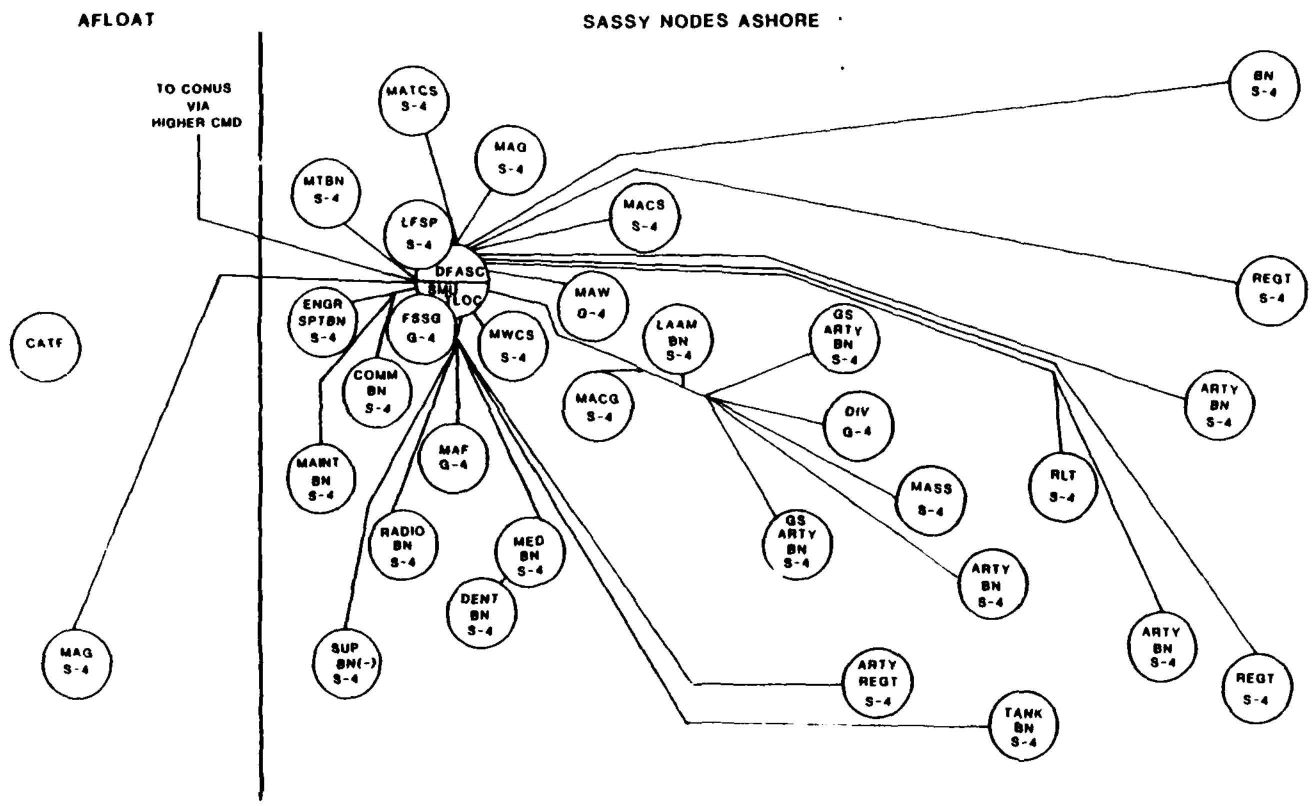


Figure C-3. SASSY Nodes D+11 (AOA)

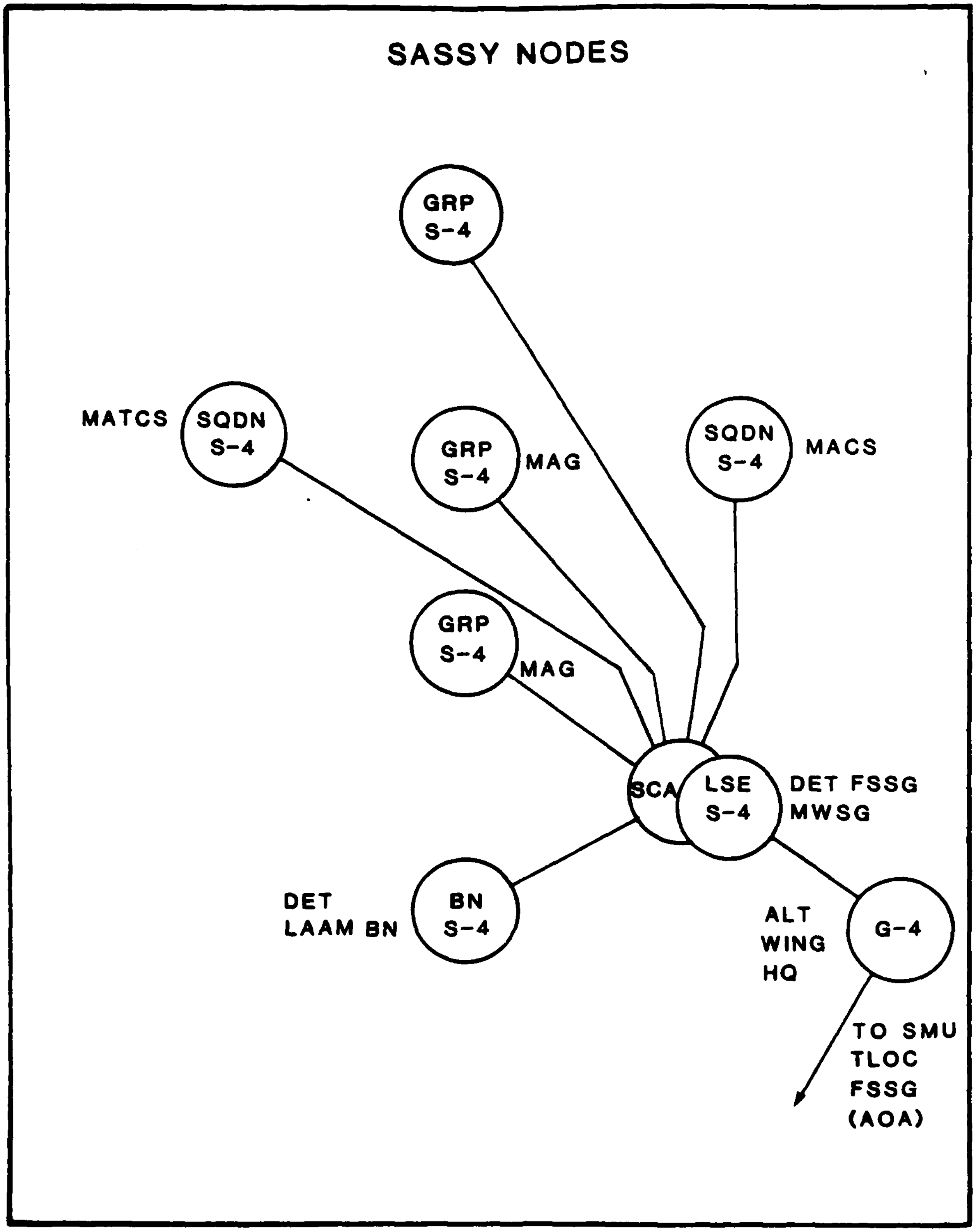


Figure C-4. SASSY Nodes D-Day to D+11 (TAE)

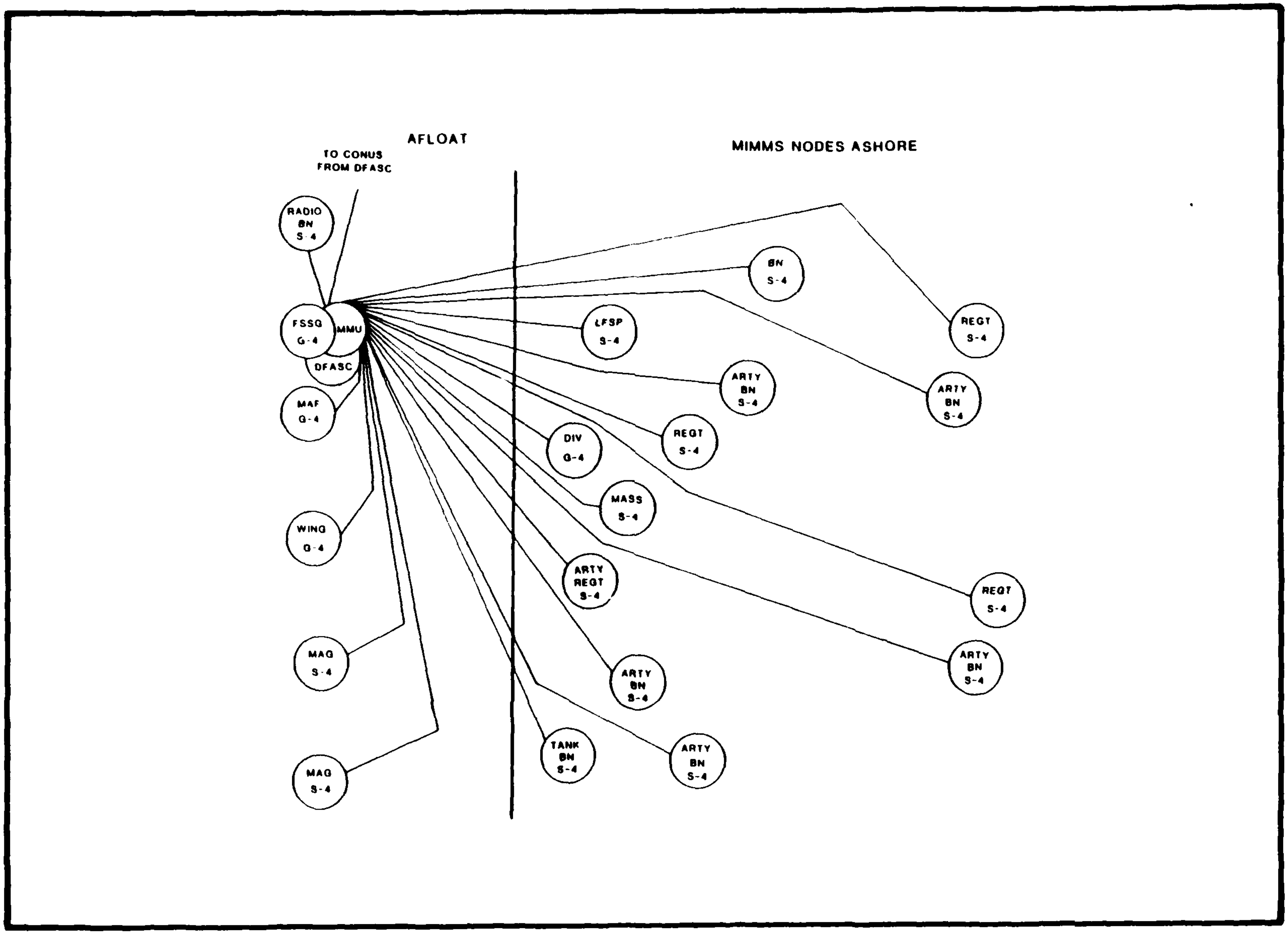


Figure C-5. MIMMS Nodes D-Day (AOA)

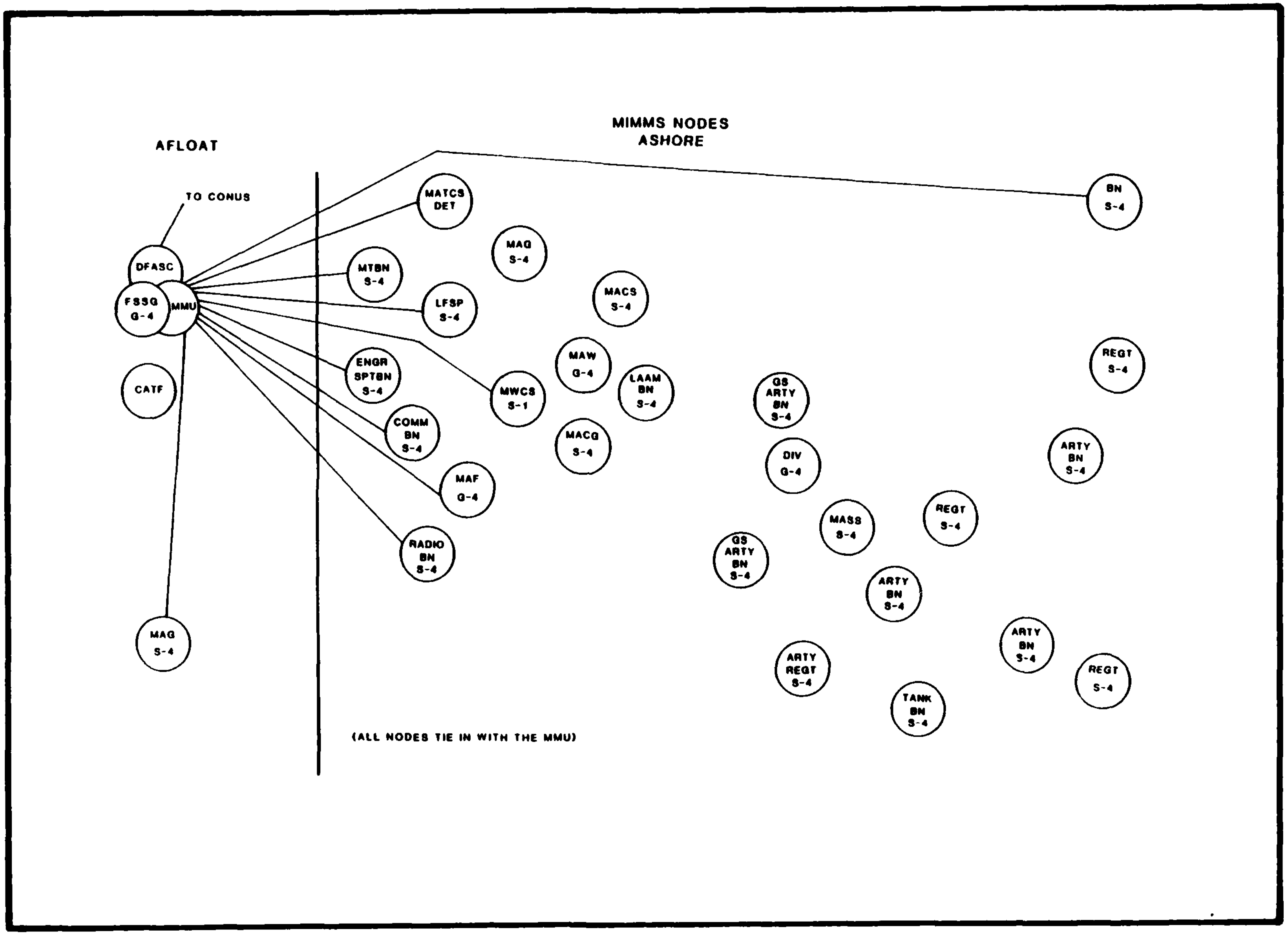


Figure C-6. MIMMS Nodes D+5 (AOA)

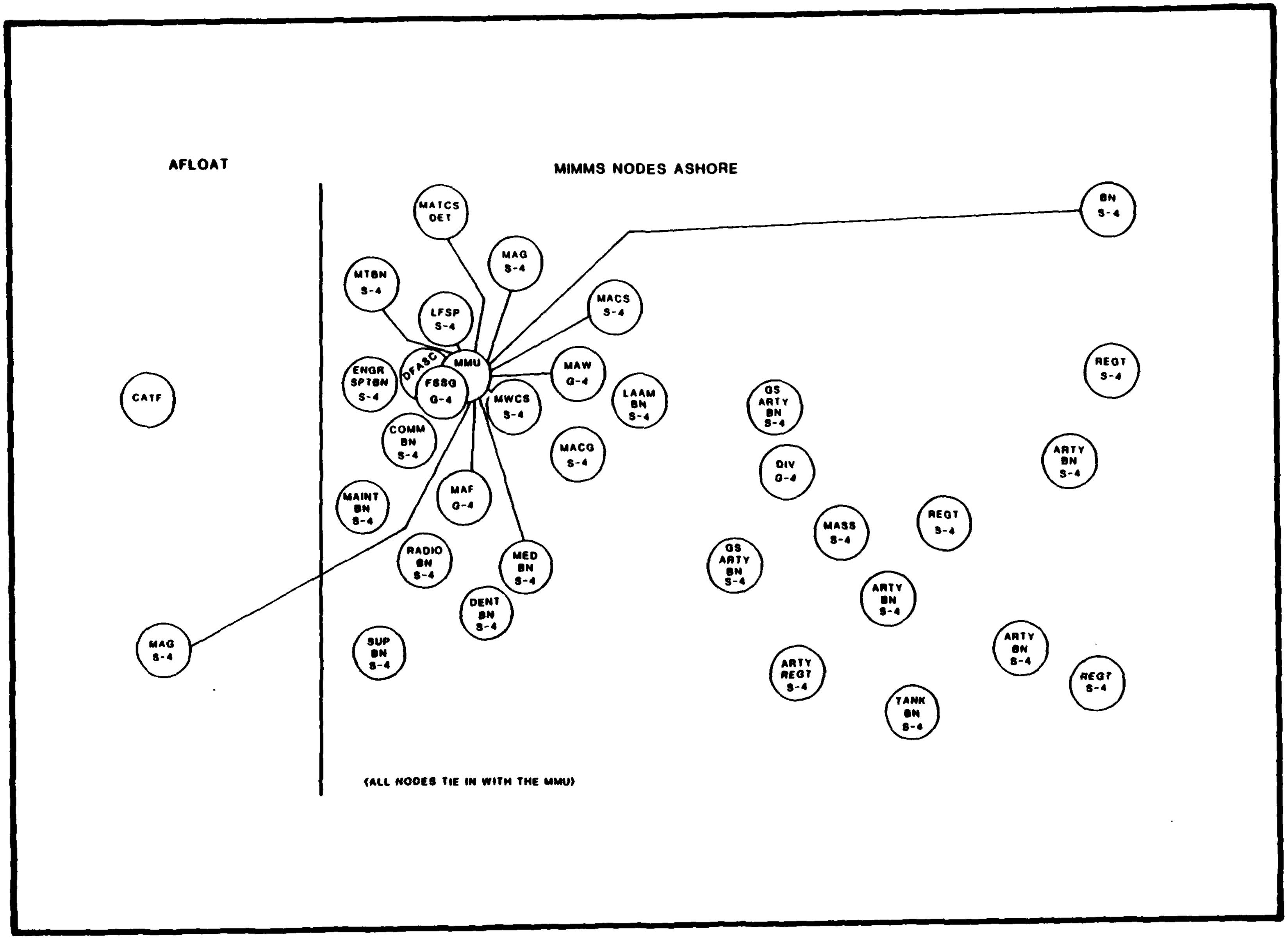


Figure C-7. MIMMS Nodes D+11 (AOA)

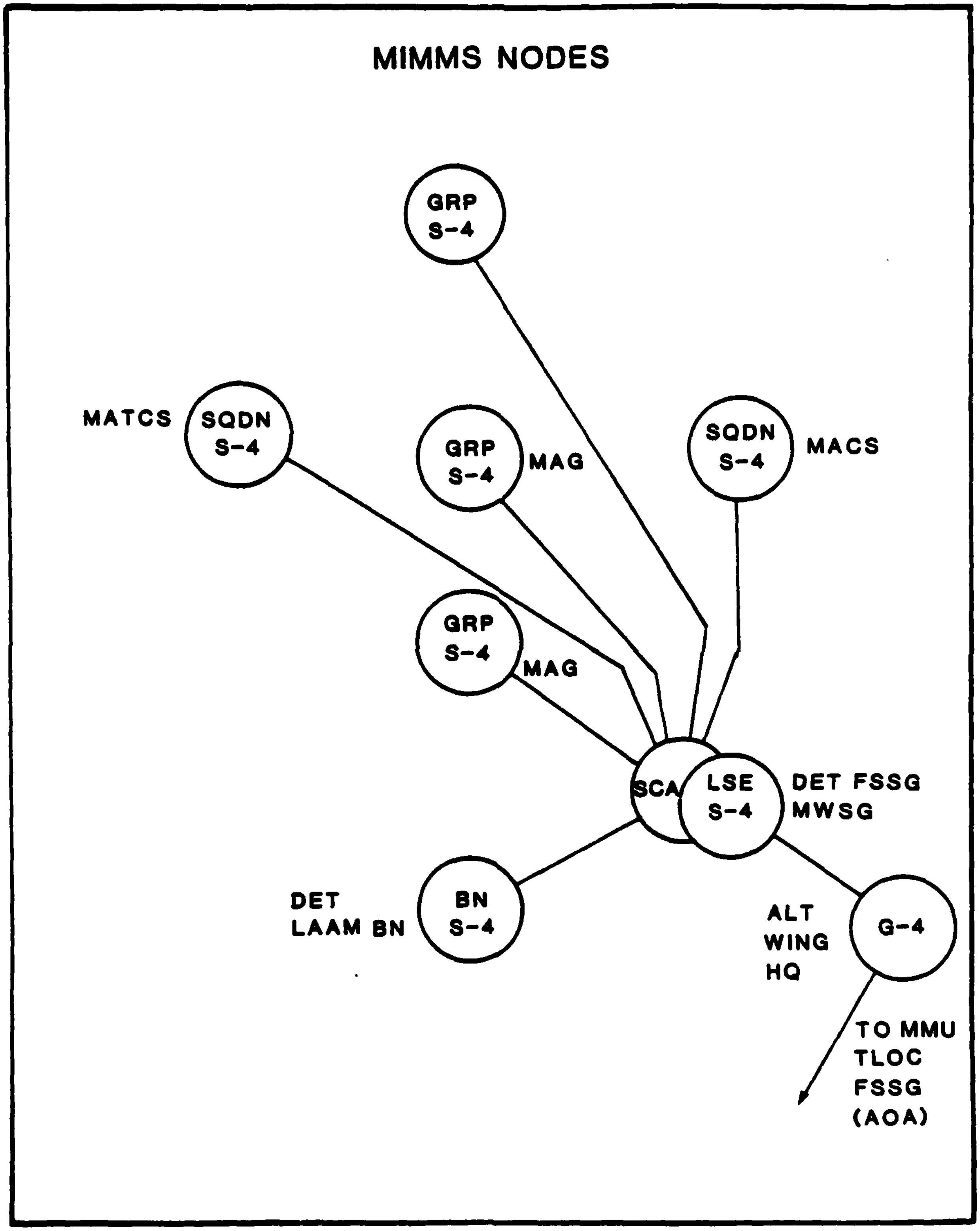


Figure C-8. MIMMS Nodes D-Day to D+11 (TAE)

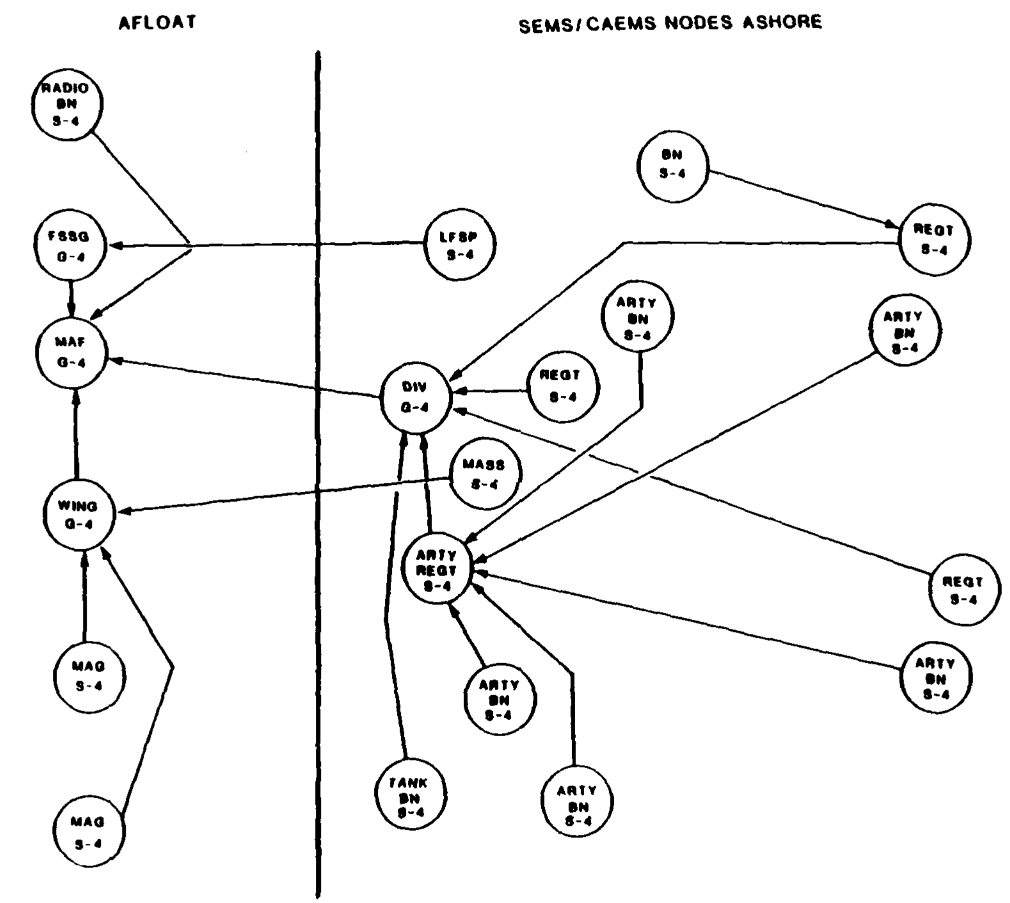


Figure C-9. SEMS/CAEMS Nodes D-Day (AOA)

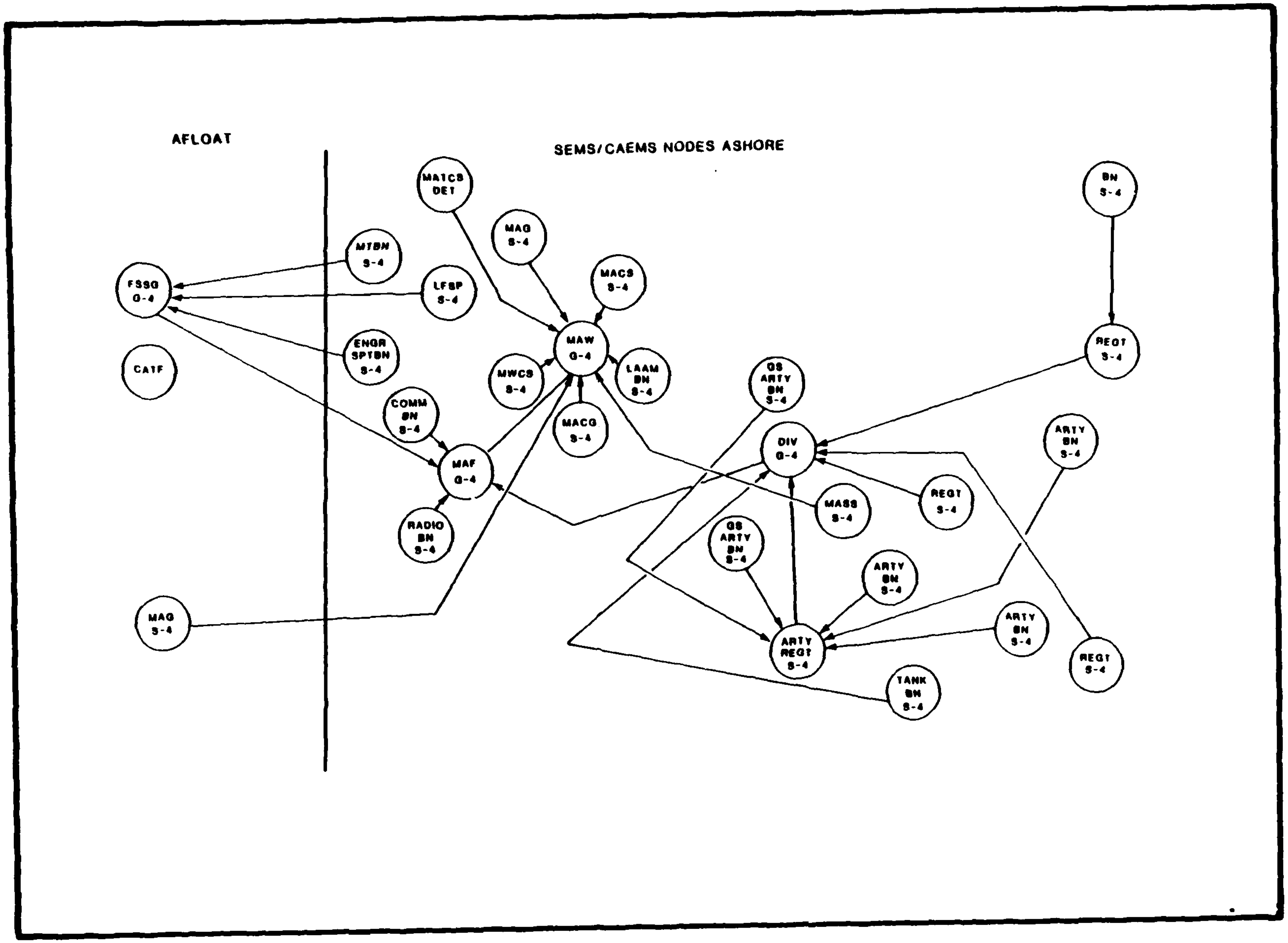


Figure C-10. SEMS/CAEMS Nodes D+5 (AOA)

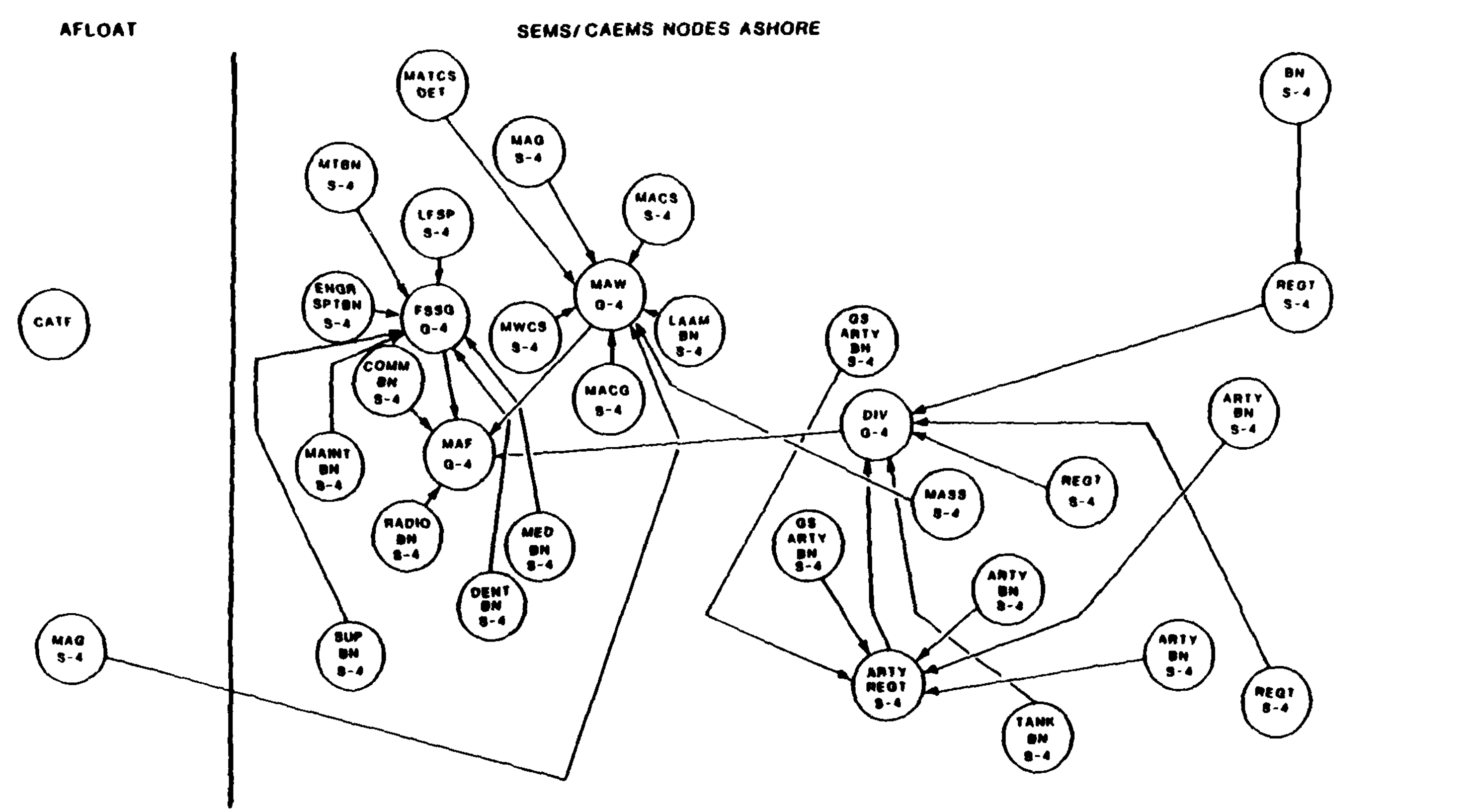


Figure C-11. SEMS/CAEMS Nodes D+11 (AOA)

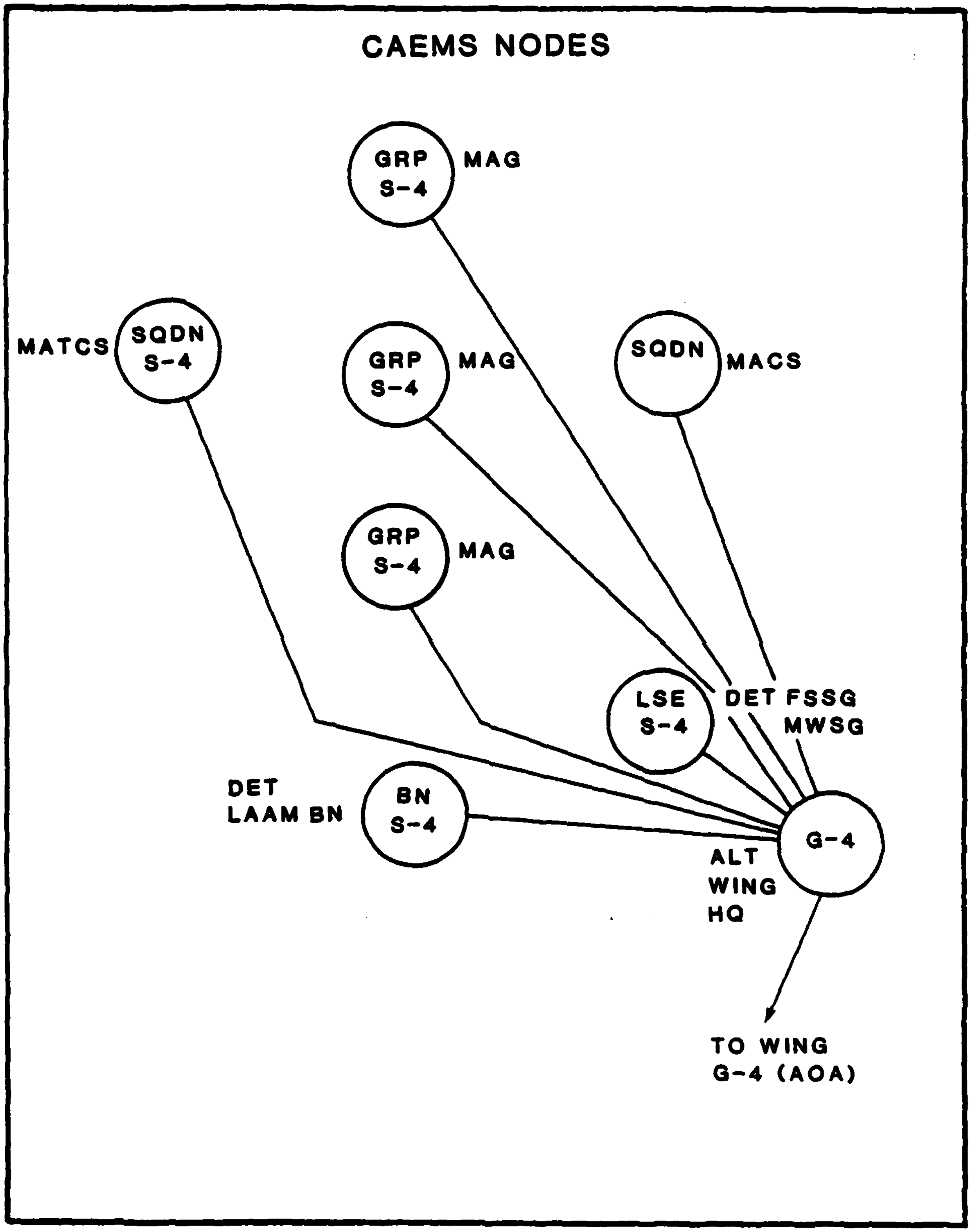


Figure C-12. CAEMS Nodes D-Day to D+11 (TAE)

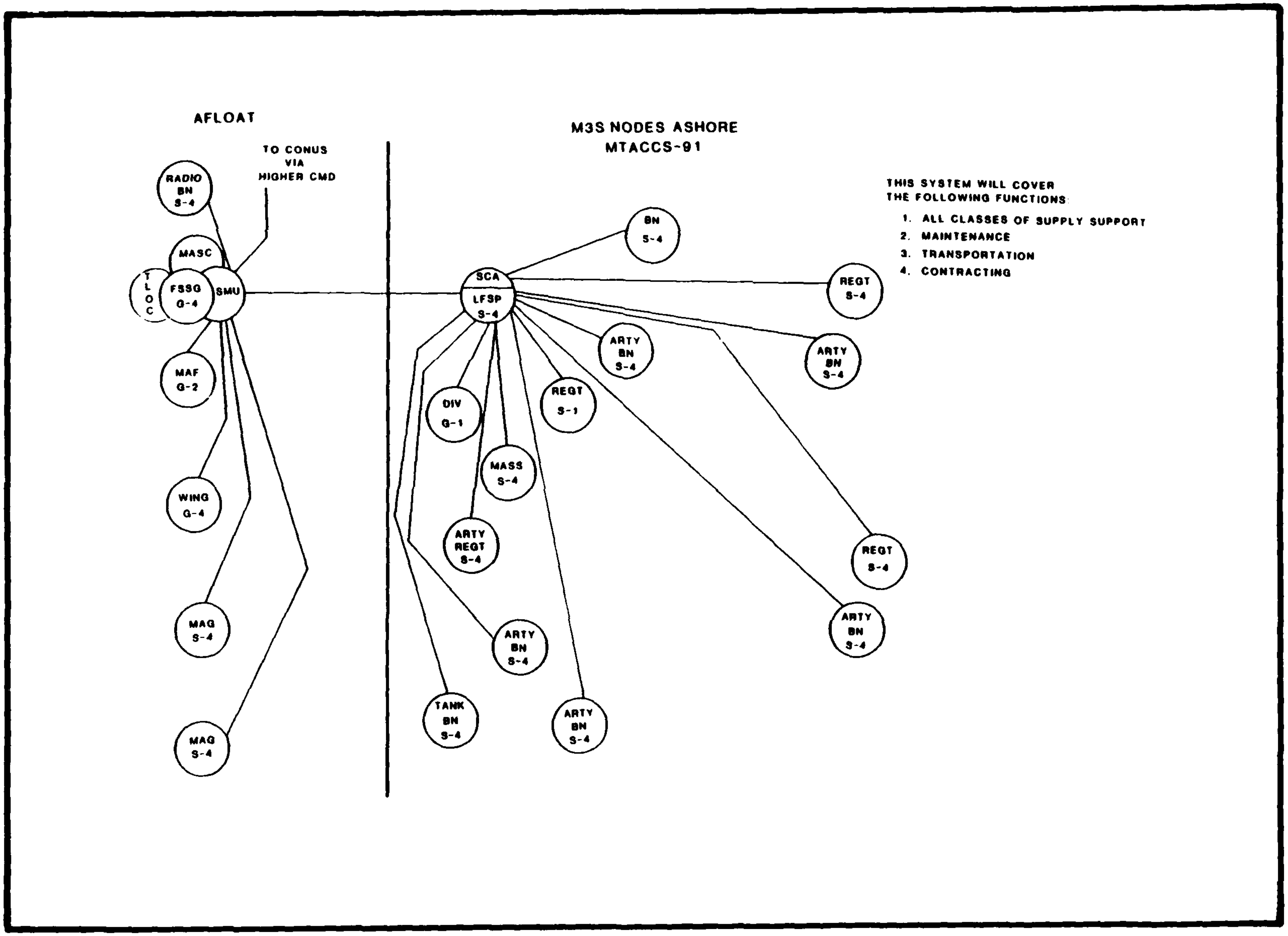


Figure C-13. M3S Nodes D-Day (AOA)

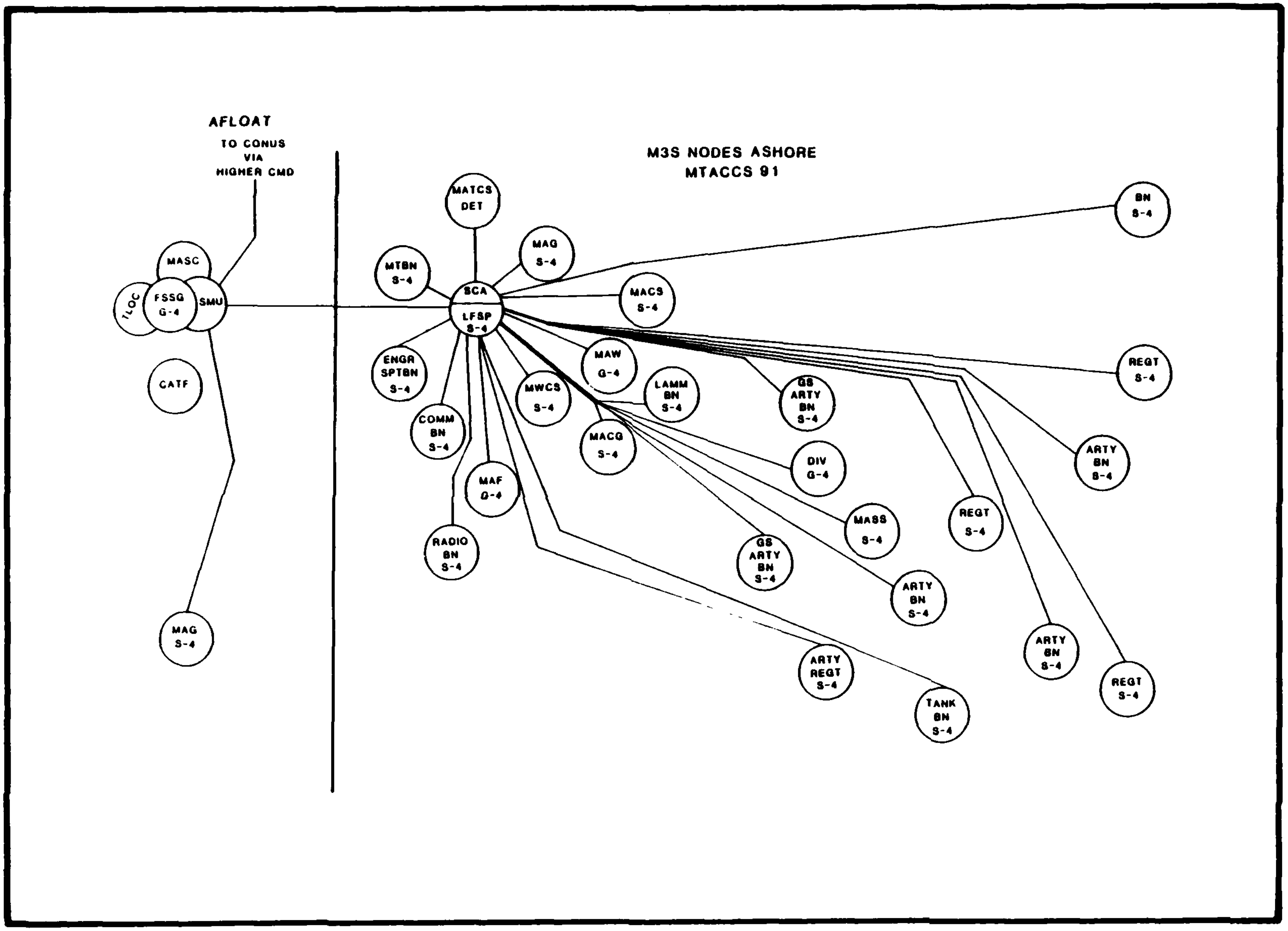


Figure C-14. M3S Nodes D+5 (AOA)

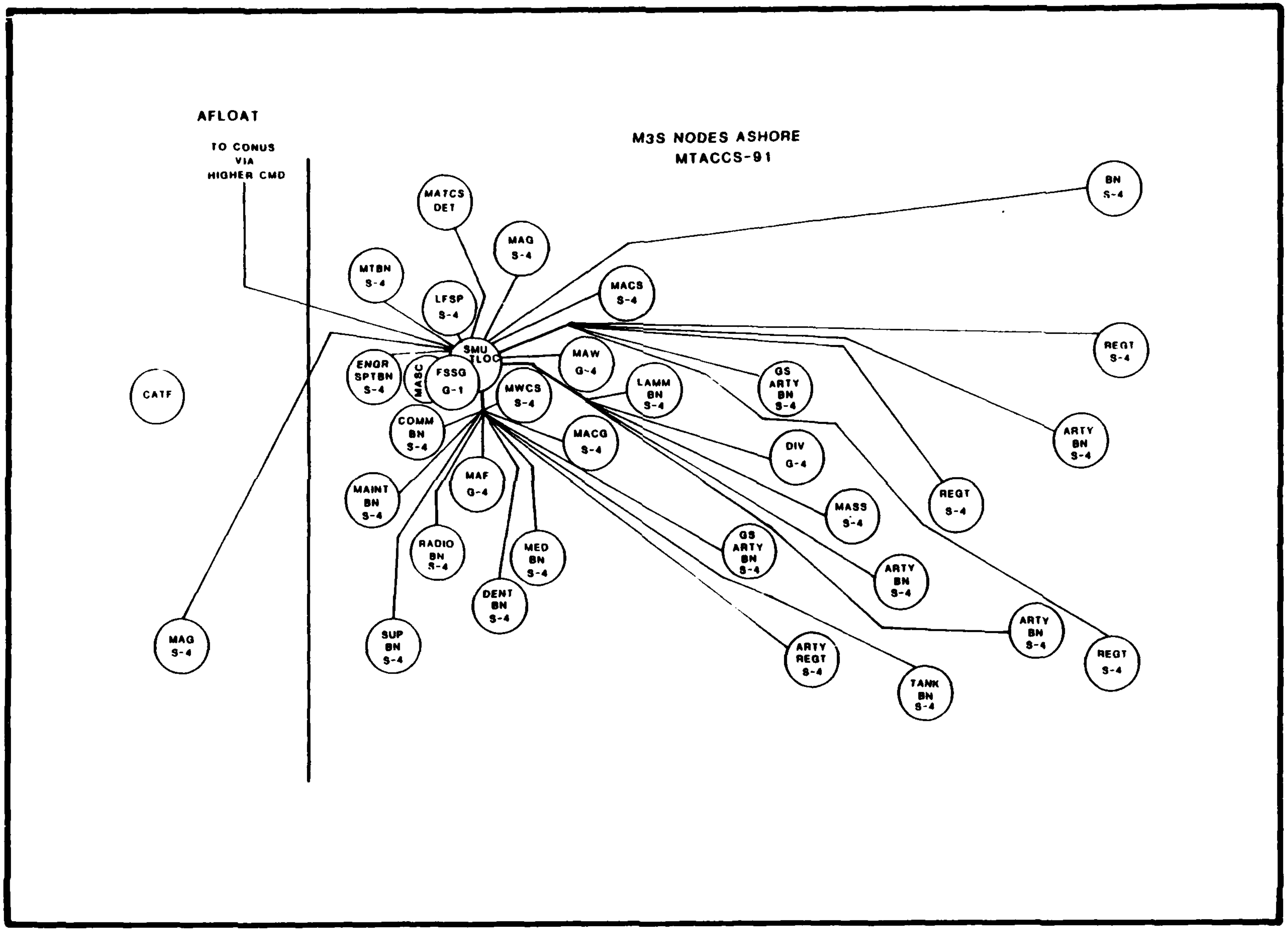


Figure C-15. M3S Nodes D+11 (AOA)

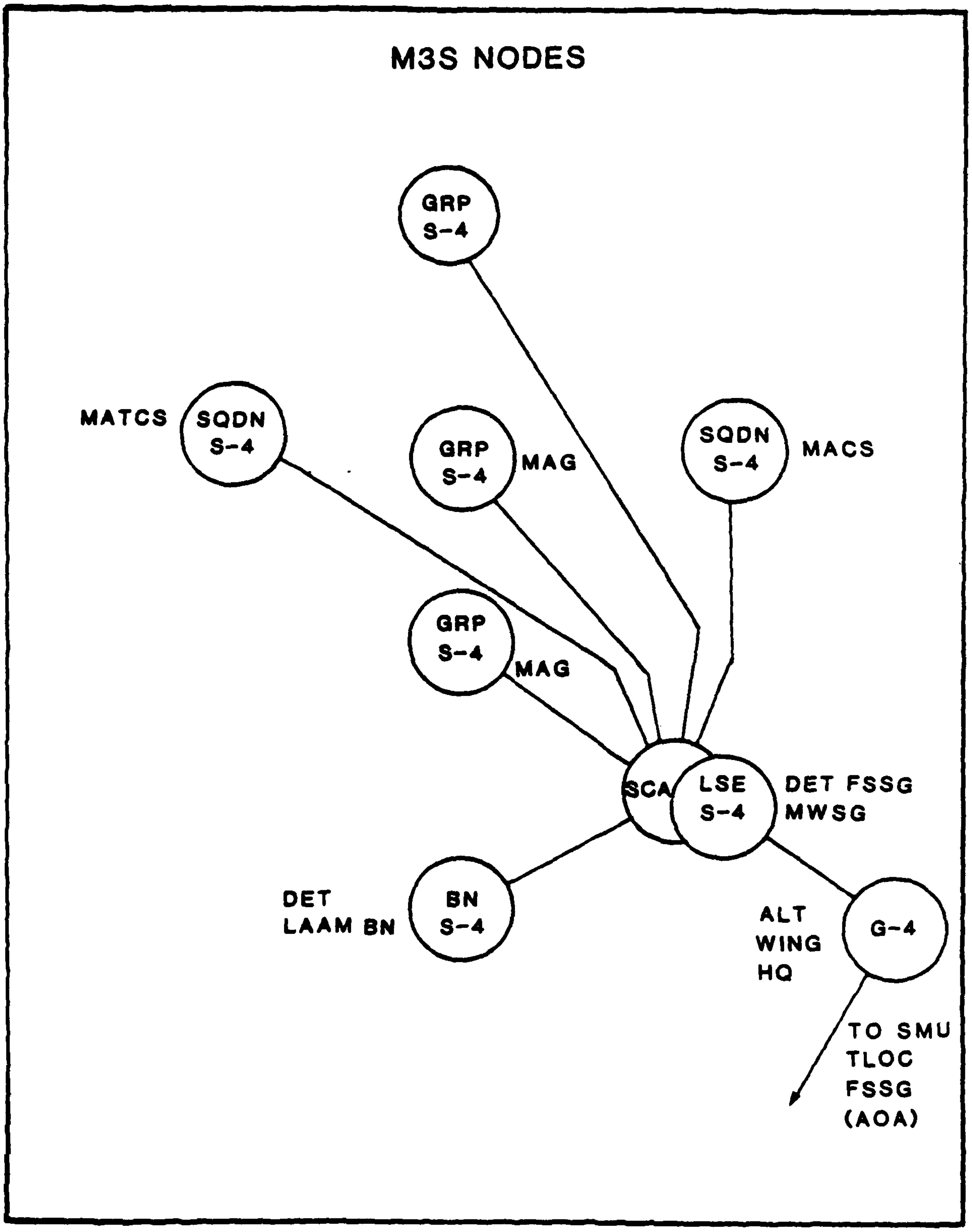


Figure C-16. M3S Nodes D-Day to D+11 (TAE)

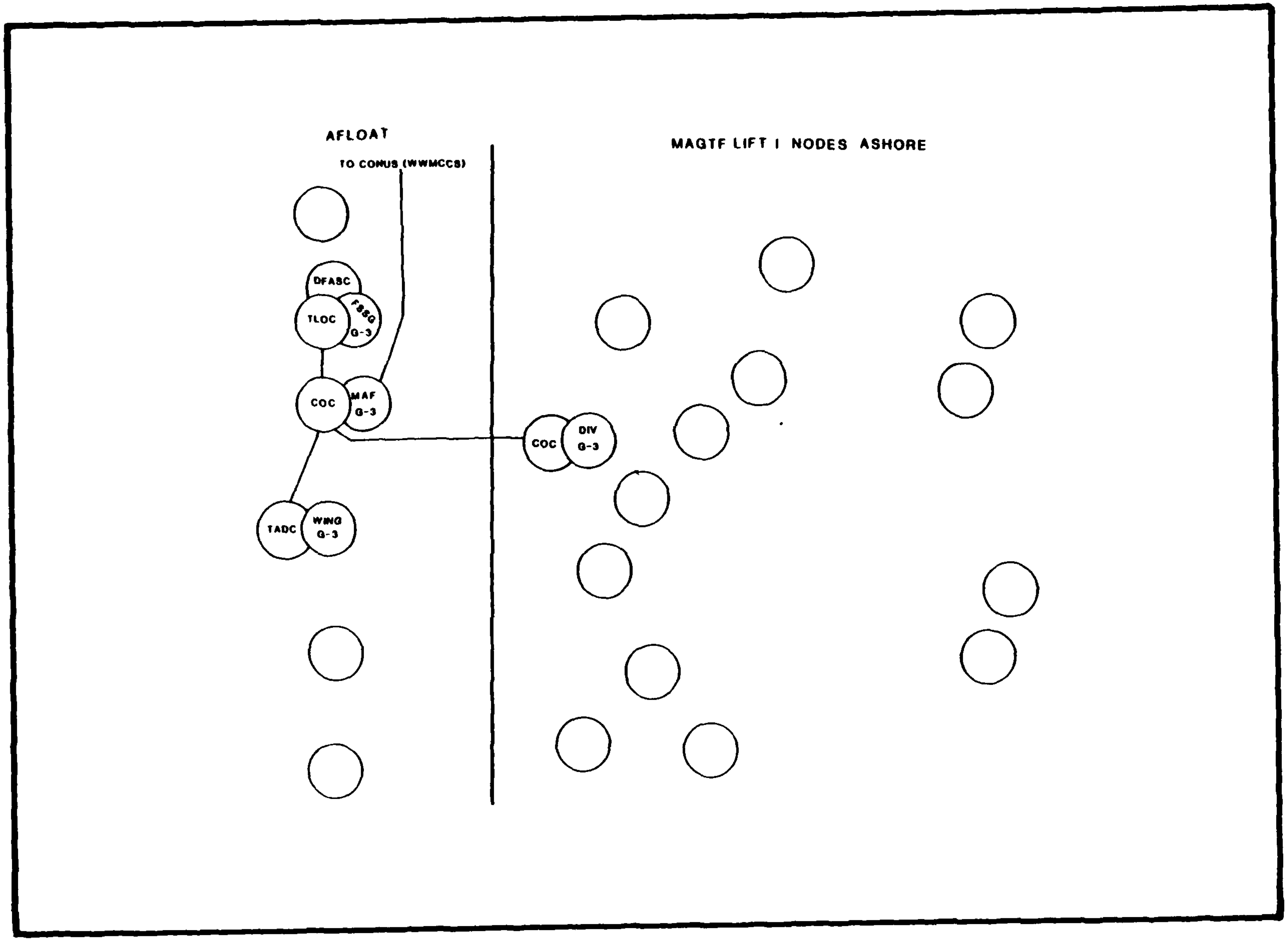
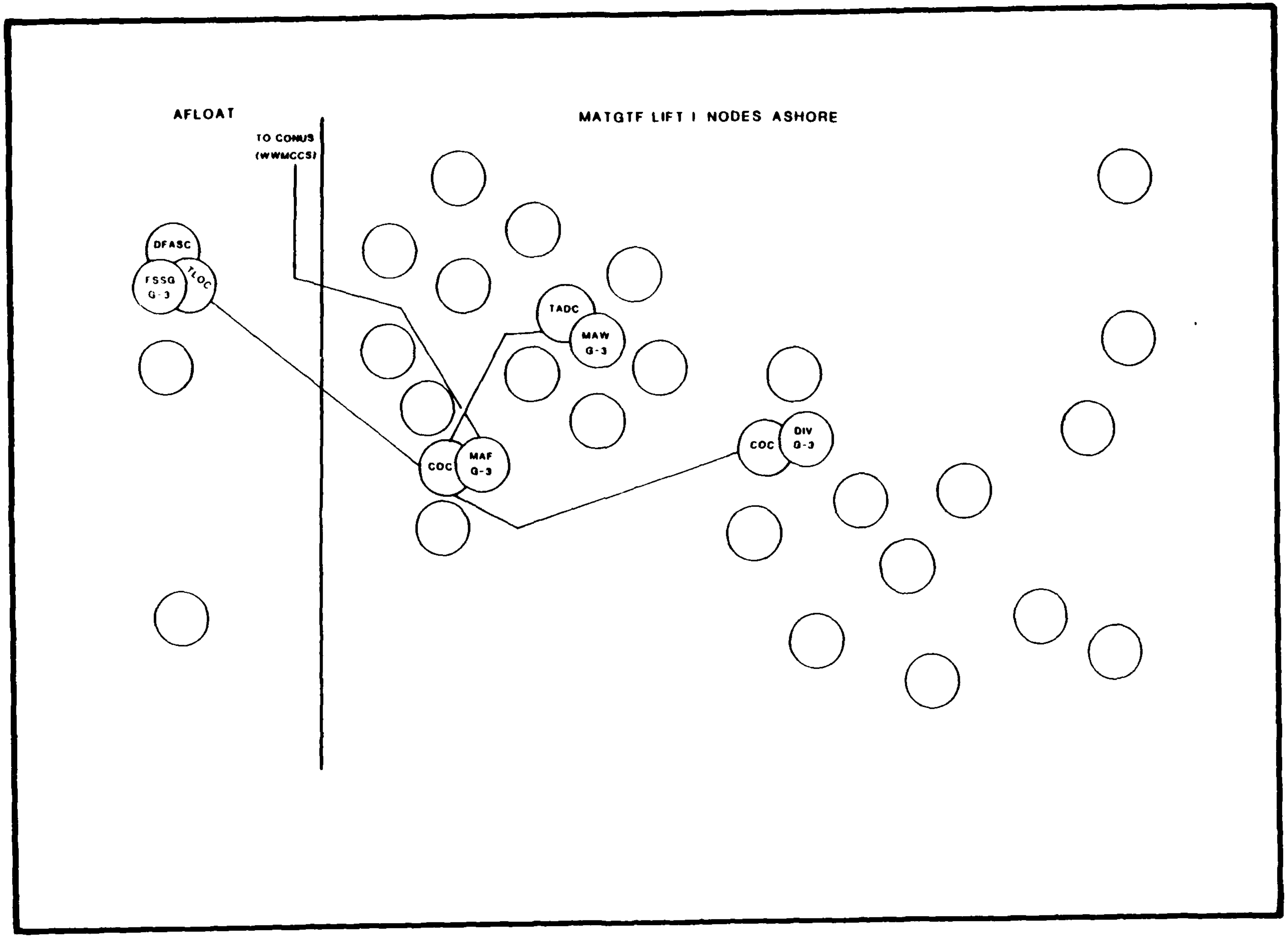


Figure C-17. MAGTF LIFT I Nodes D-Day (AOA)



C-18. MAGTF LIFT I Nodes D+5 (AOA)

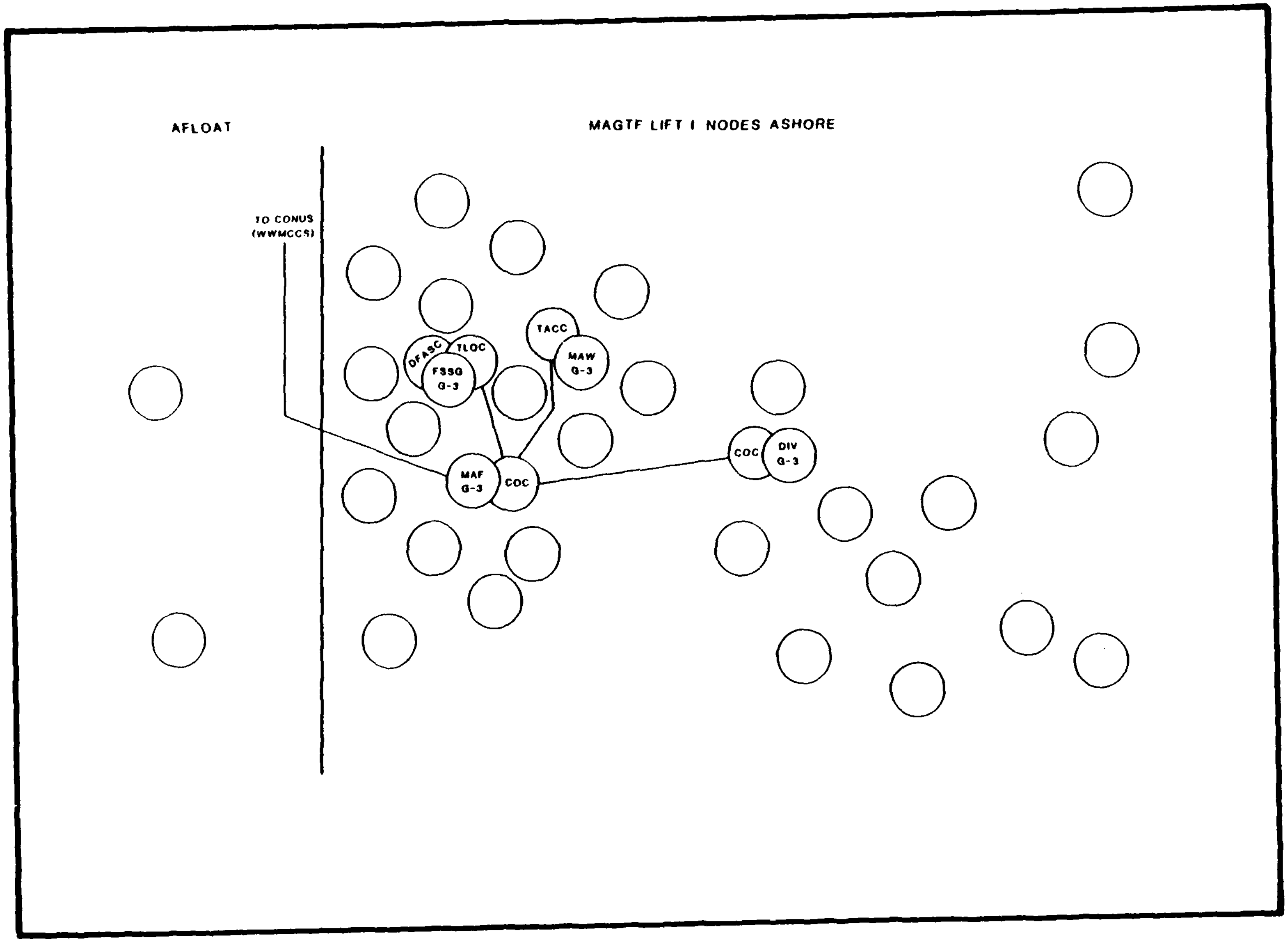


Figure C-19. MAGTF LIFT I Nodes D+11 (AOA)

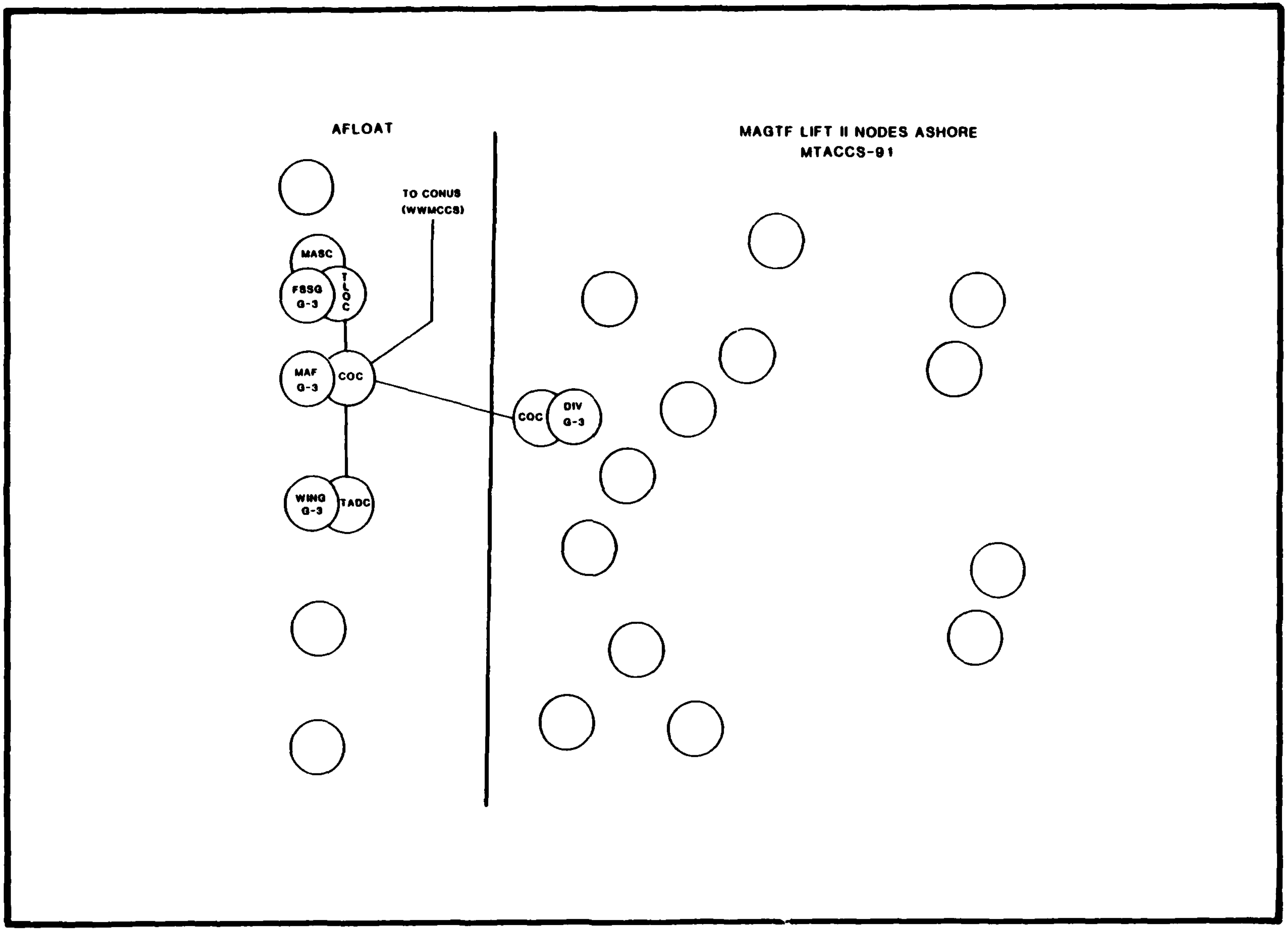


Figure C-20. MAGTF LIFT II Nodes D-Day (AOA)

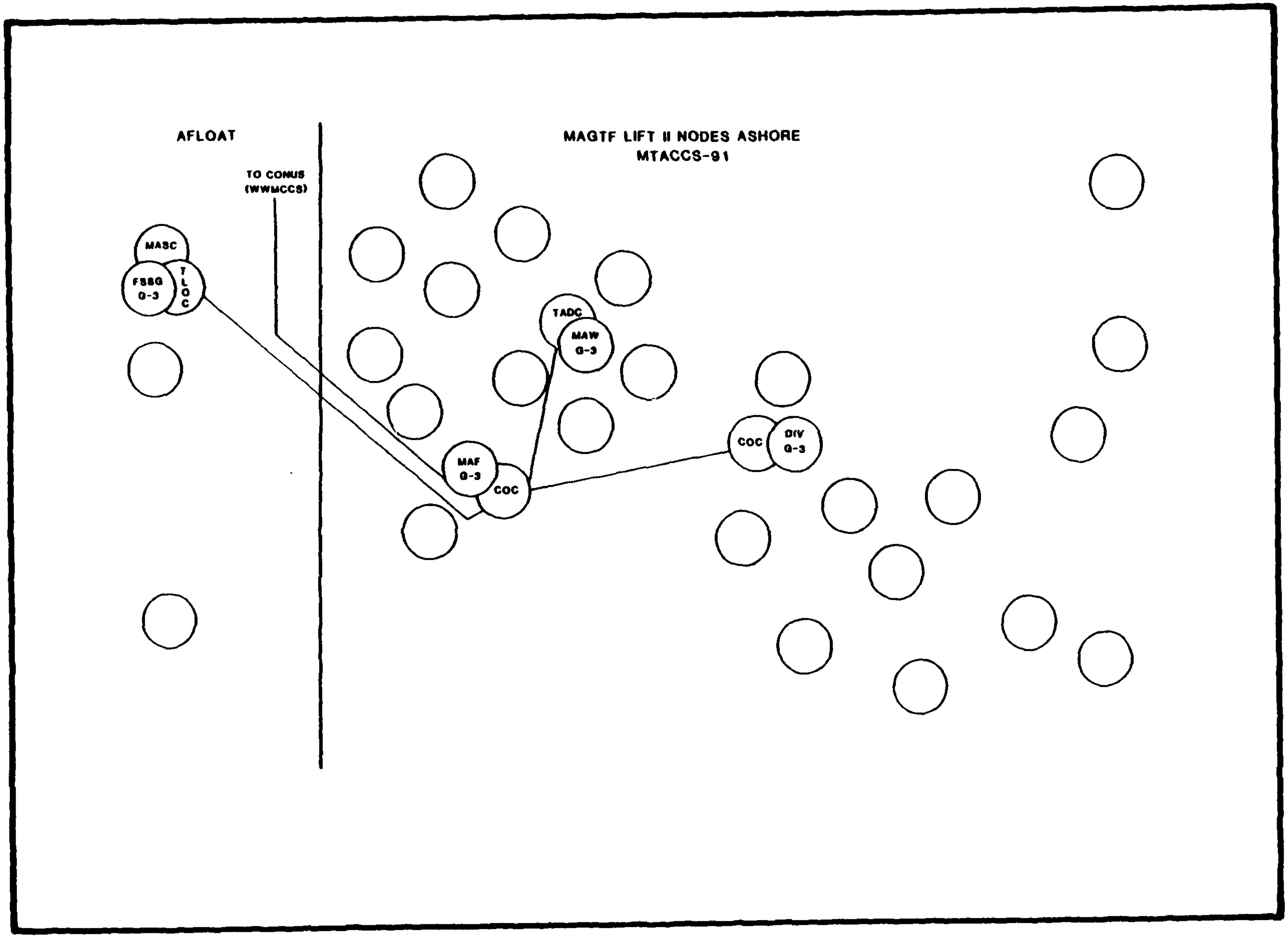


Figure C-21. MAGTF LIFT II Nodes D+5 (AOA)

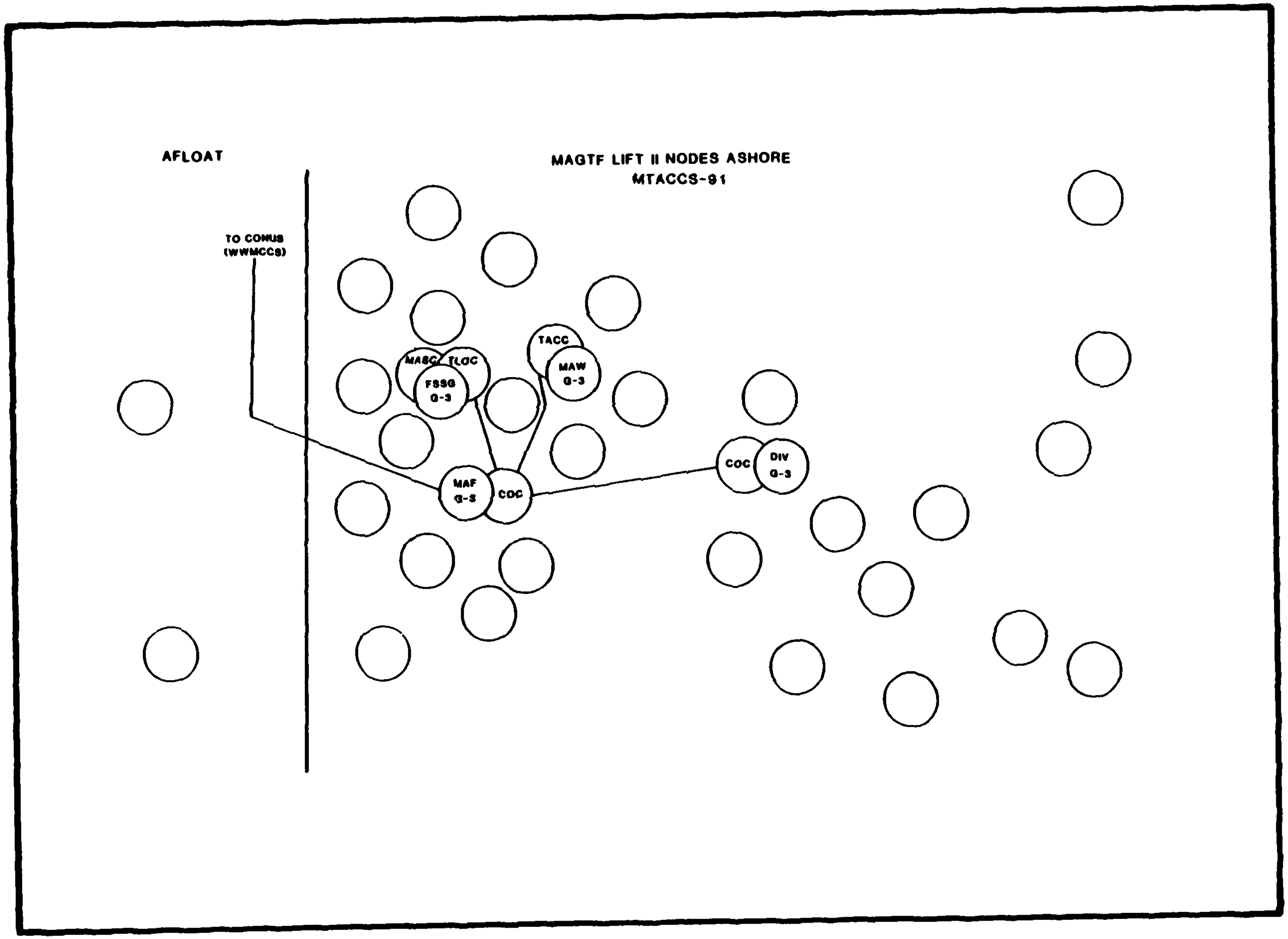


Figure C-22. MAGTF LIFT II Nodes D+11 (AOA)

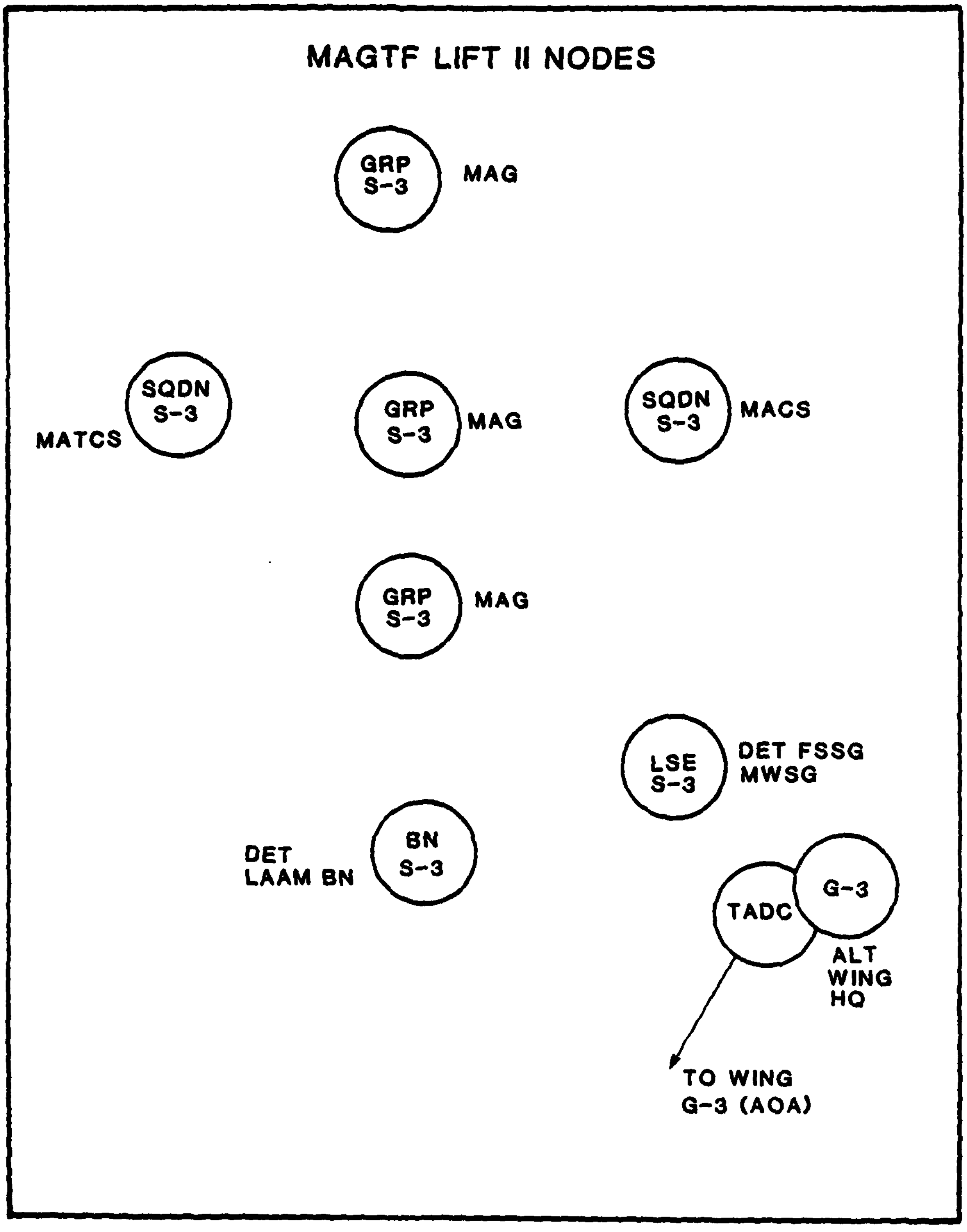


Figure C-23. MAGTF LIFT II Nodes D-Day to D+11 (TAE)

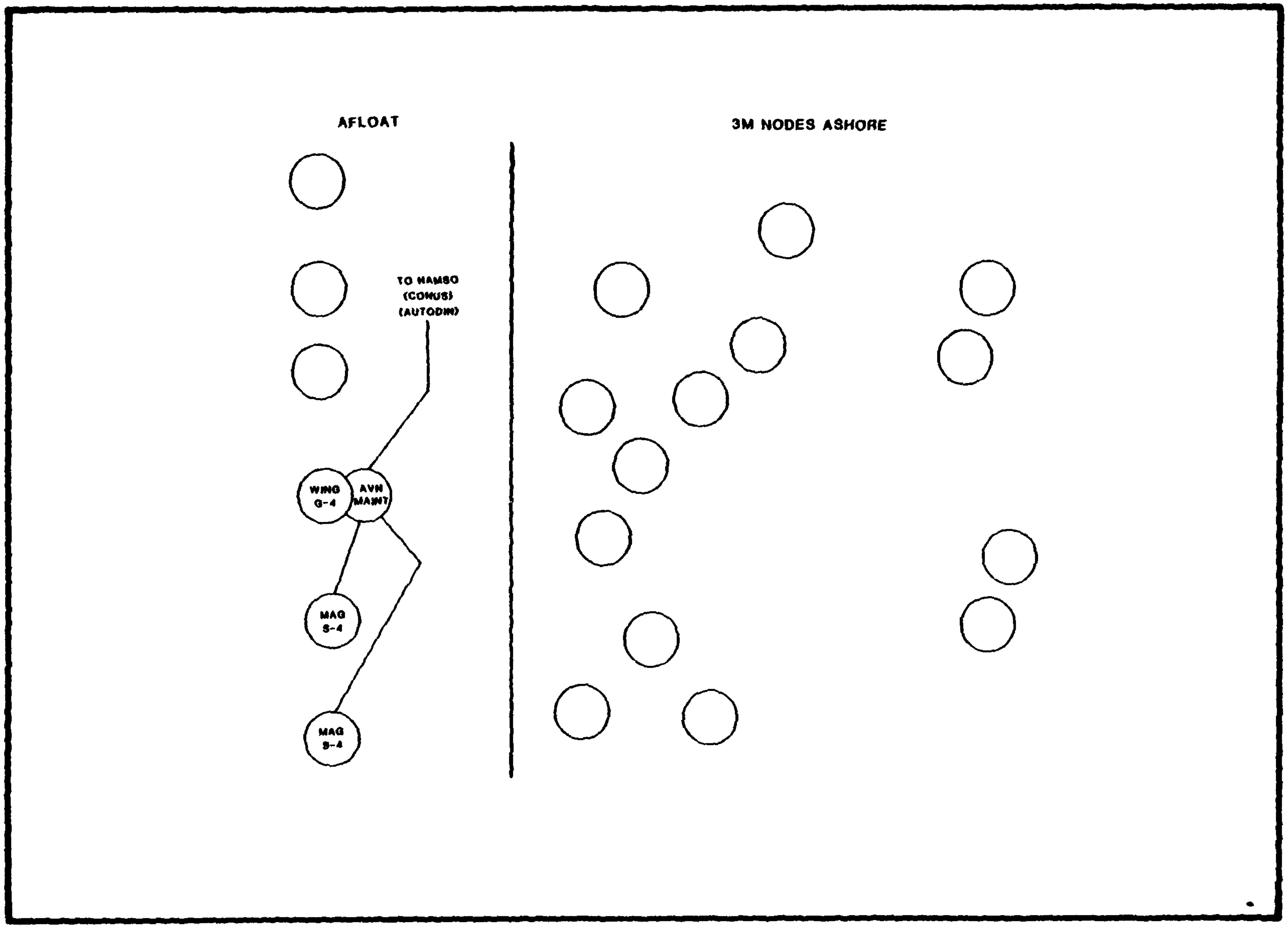


Figure C-24. 3M Nodes D-Day (AOA)

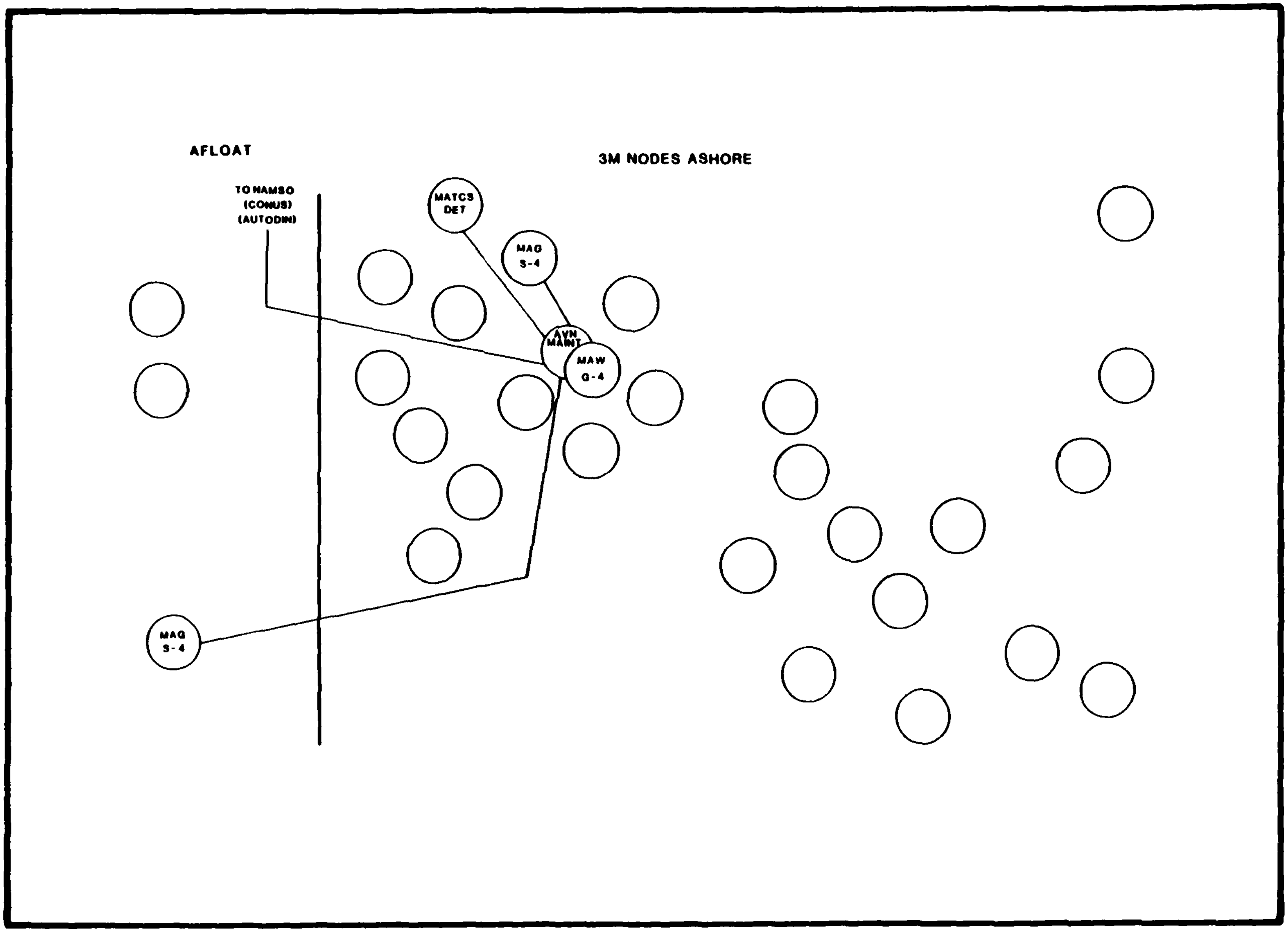


Figure C-25. 3M Nodes D+5 (AOA)

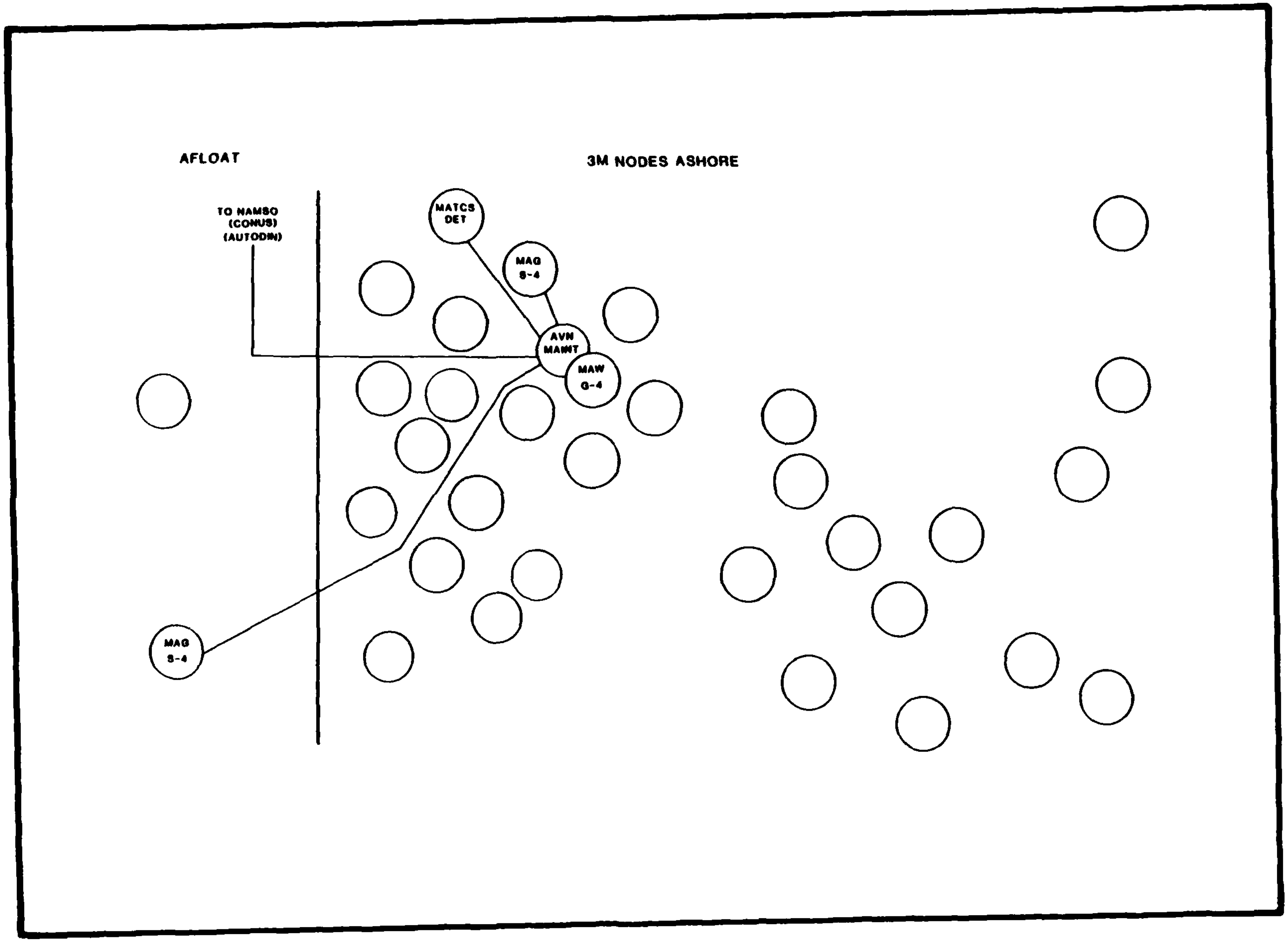


Figure C-26. 3M Nodes D+11 (AOA)

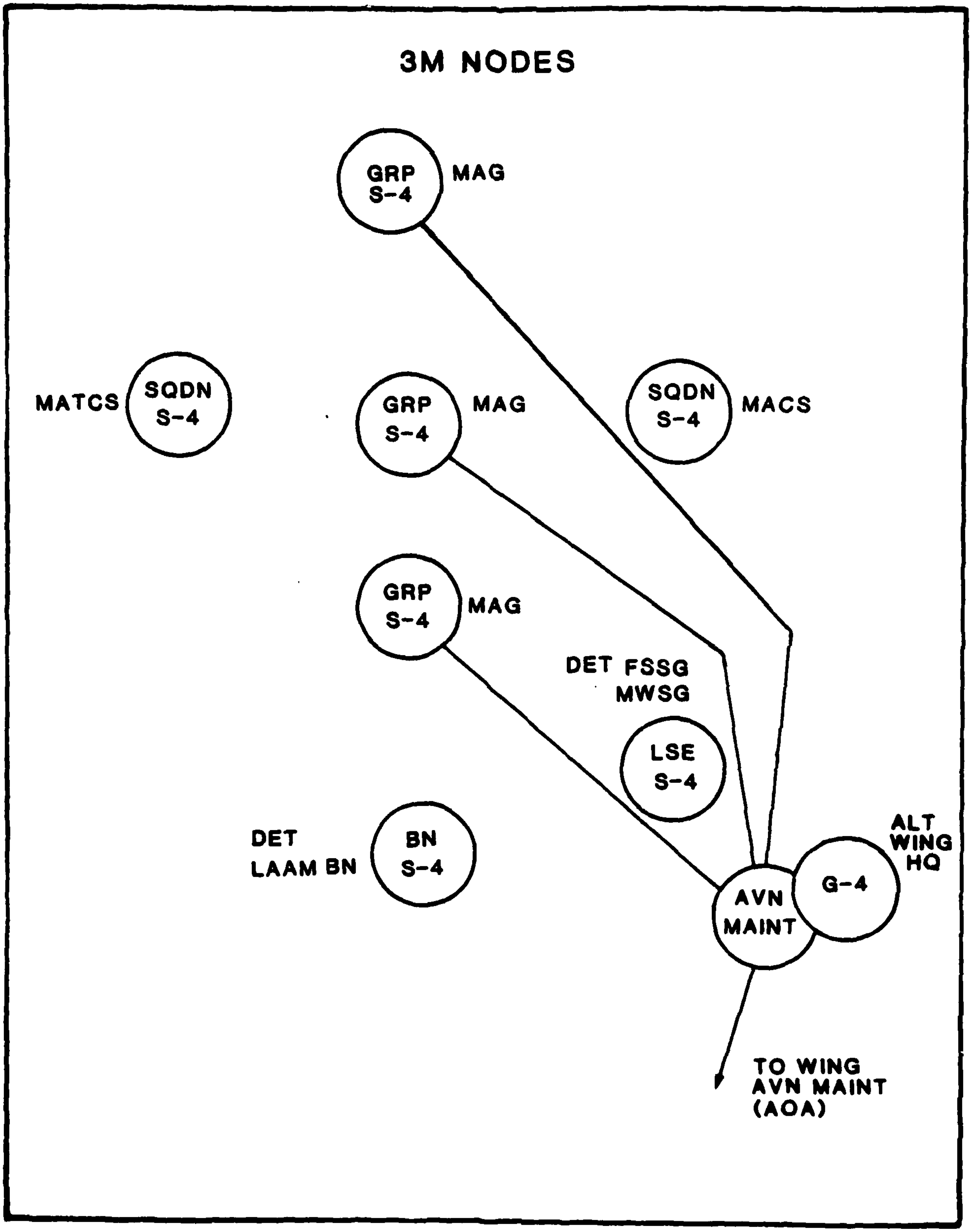


Figure C-27. 3M Nodes D-Day to D+11 (TAE)

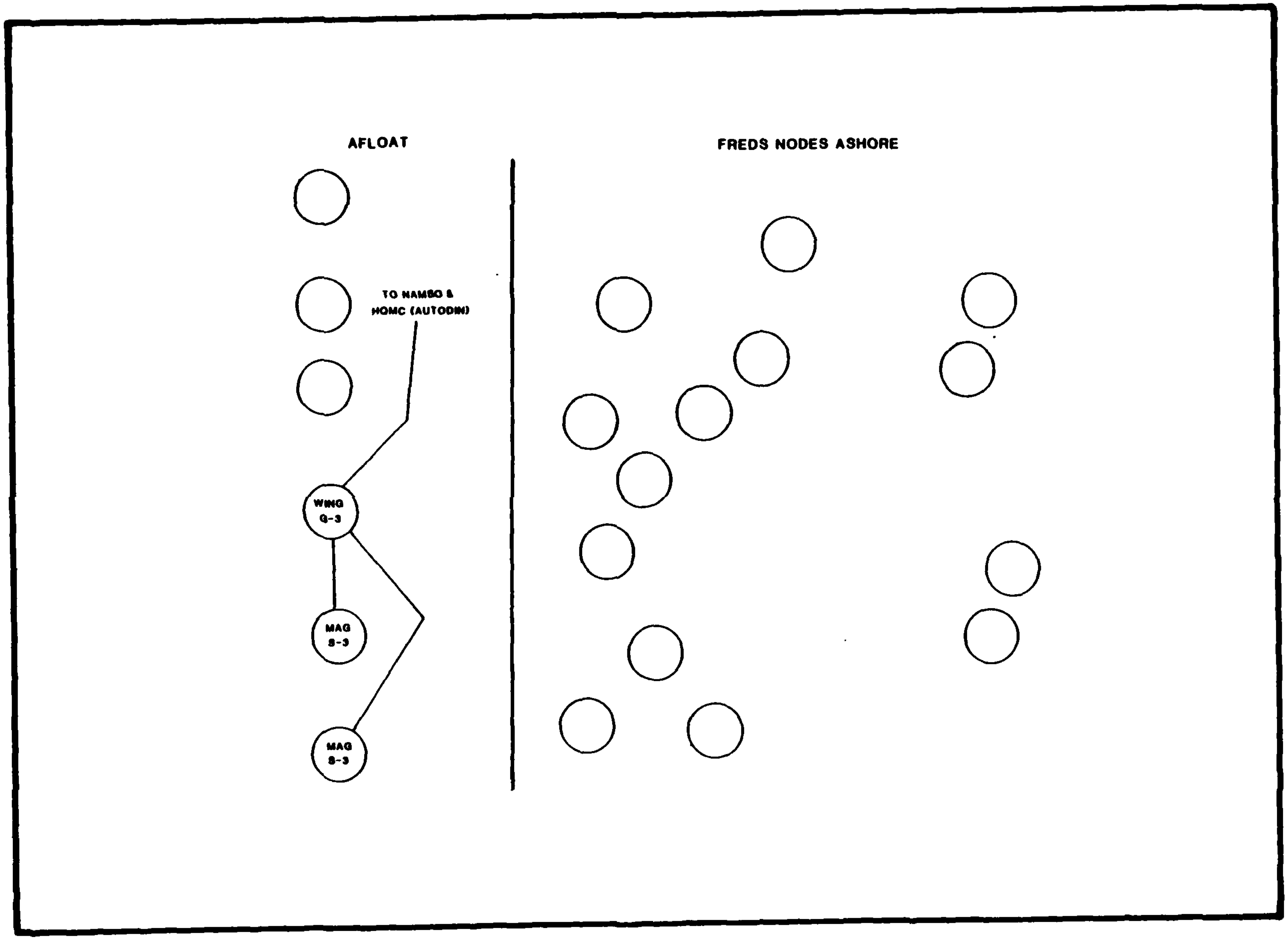


Figure C-28. FREDS Nodes D-Day (AOA)

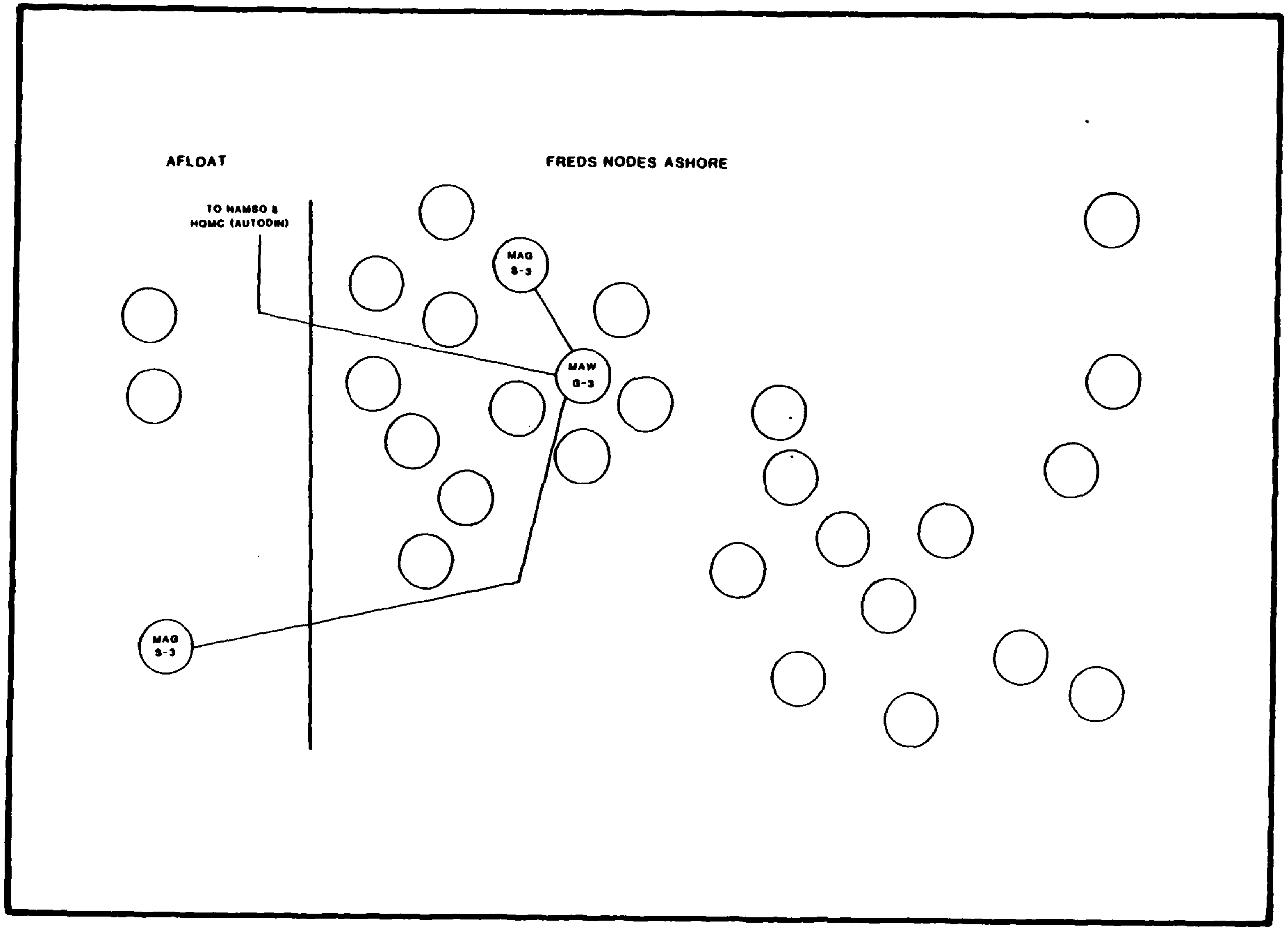


Figure C-29. FREDS Nodes D+5 (AOA)

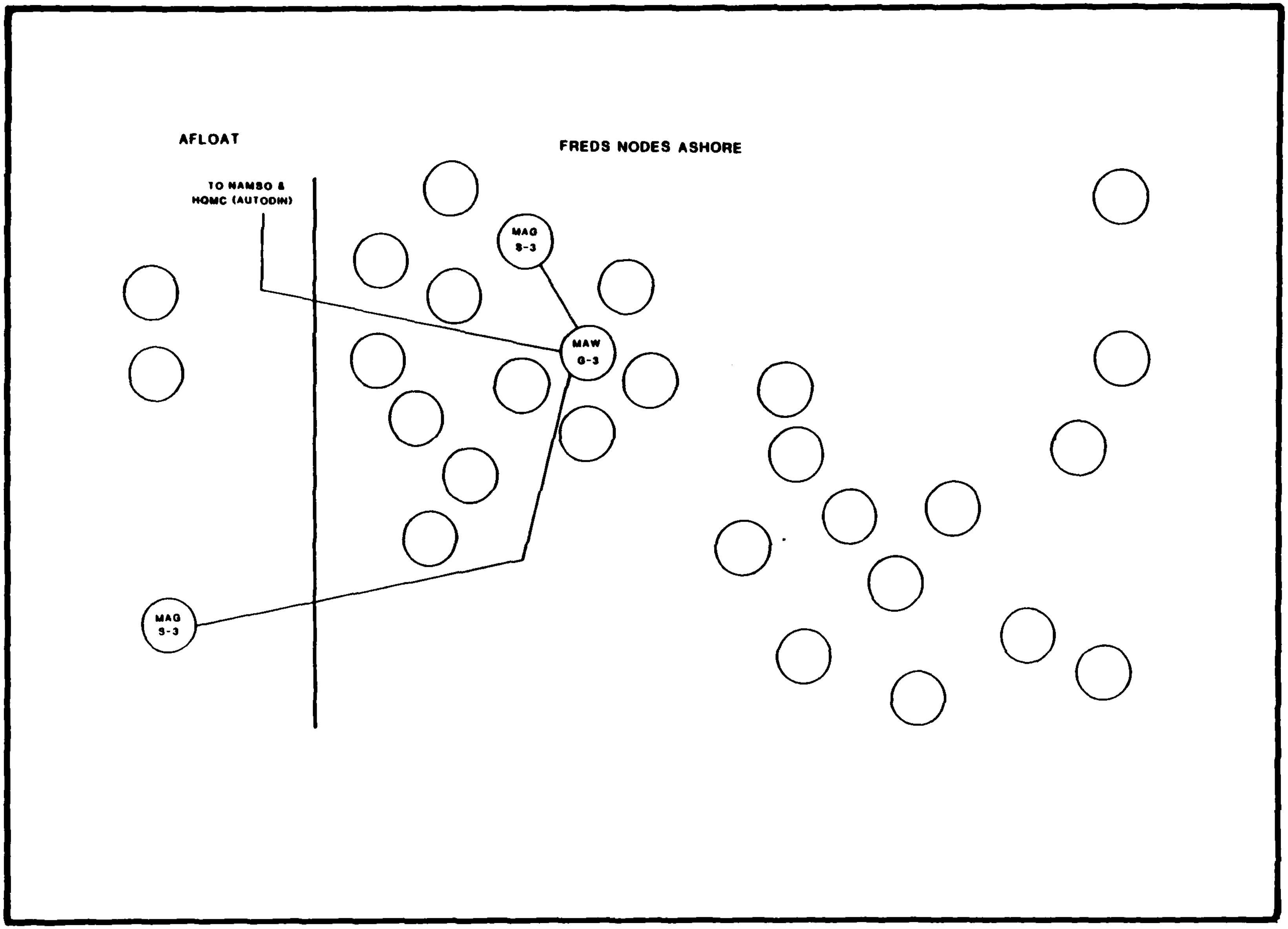


Figure C-30. FREDS Nodes D+11 (AOA)

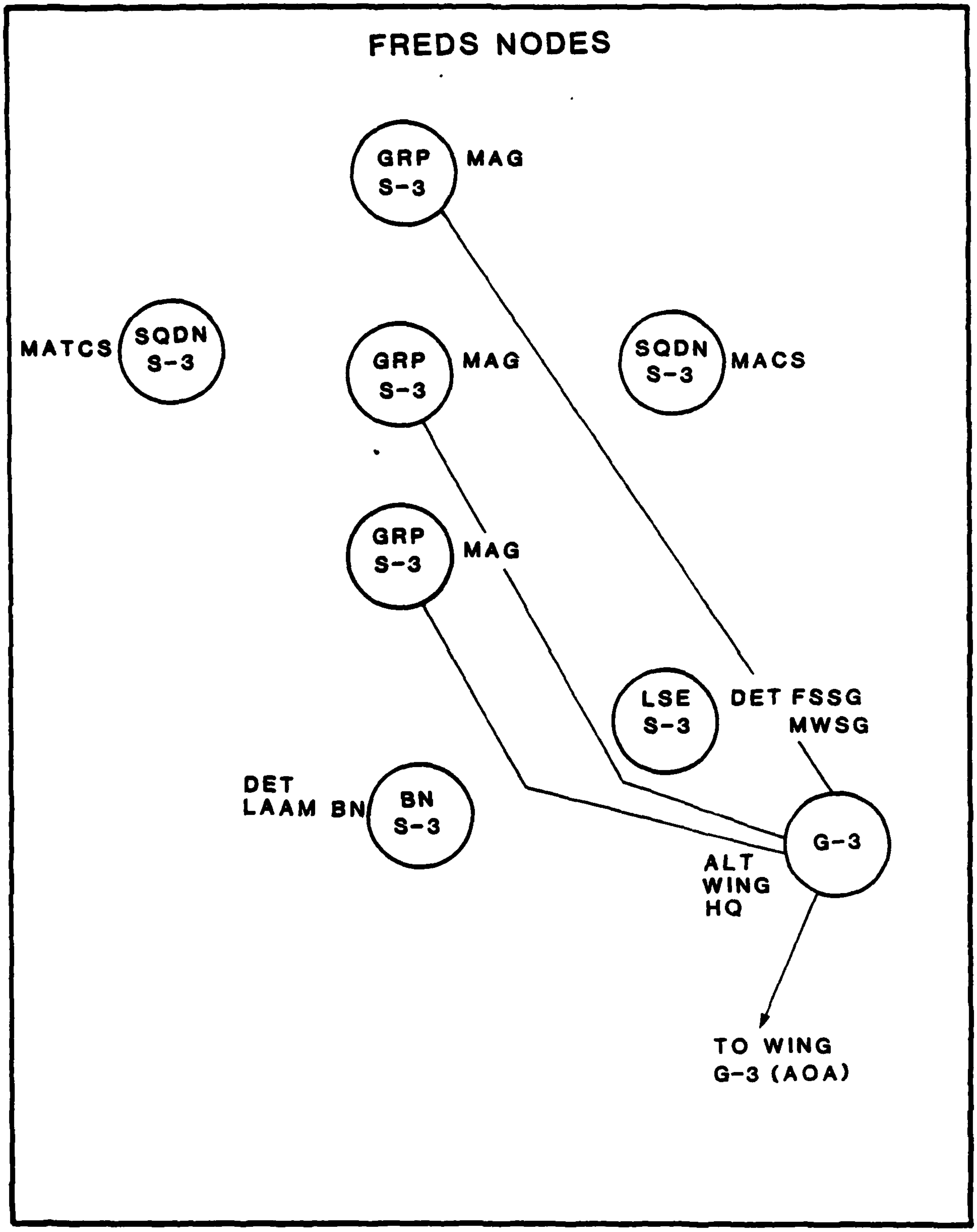


Figure C-31. FREDS Nodes D-Day to D+11 (TAE)

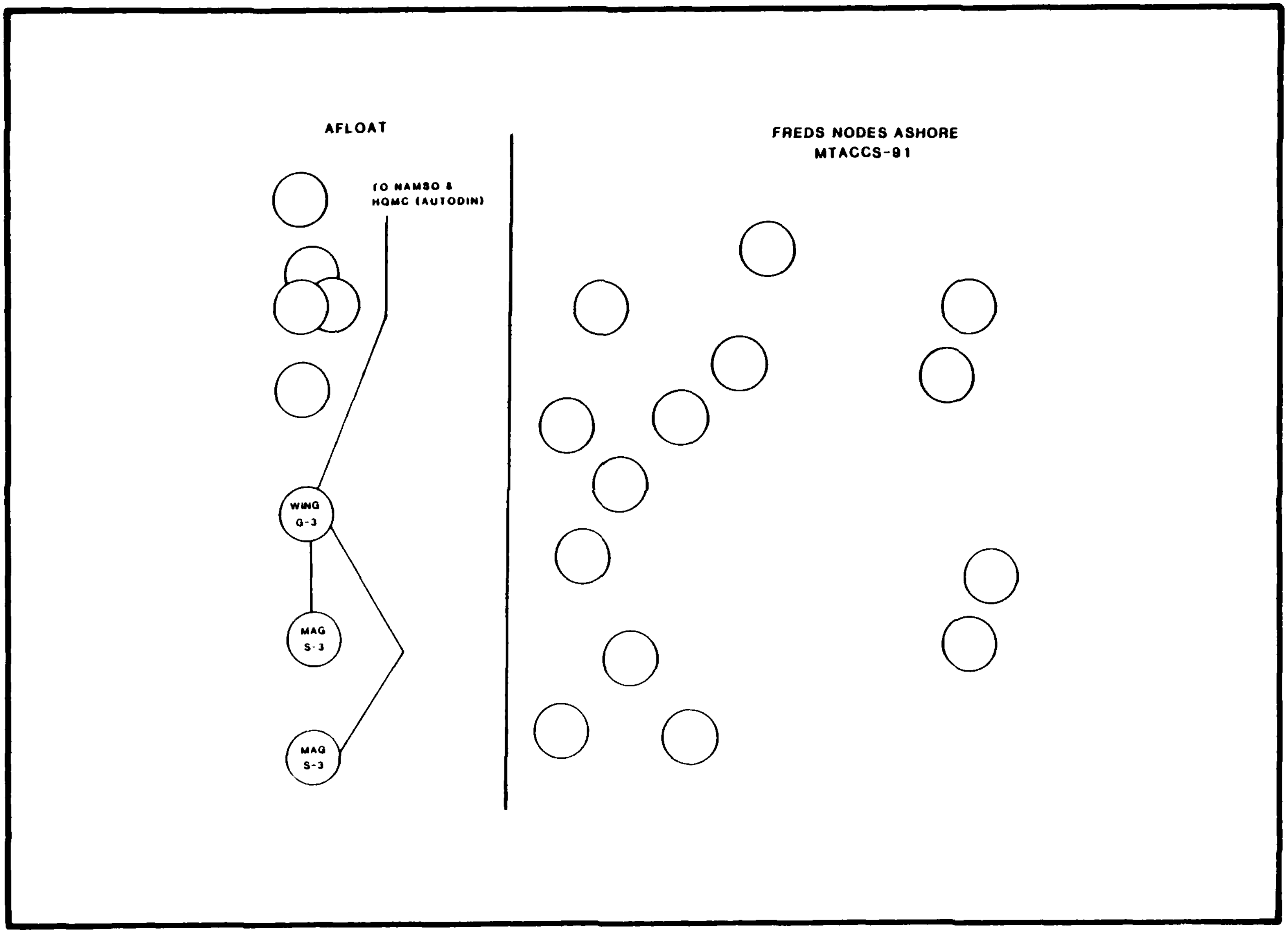


Figure C-32. FREDS Nodes D-Day (AOA MTACCS)

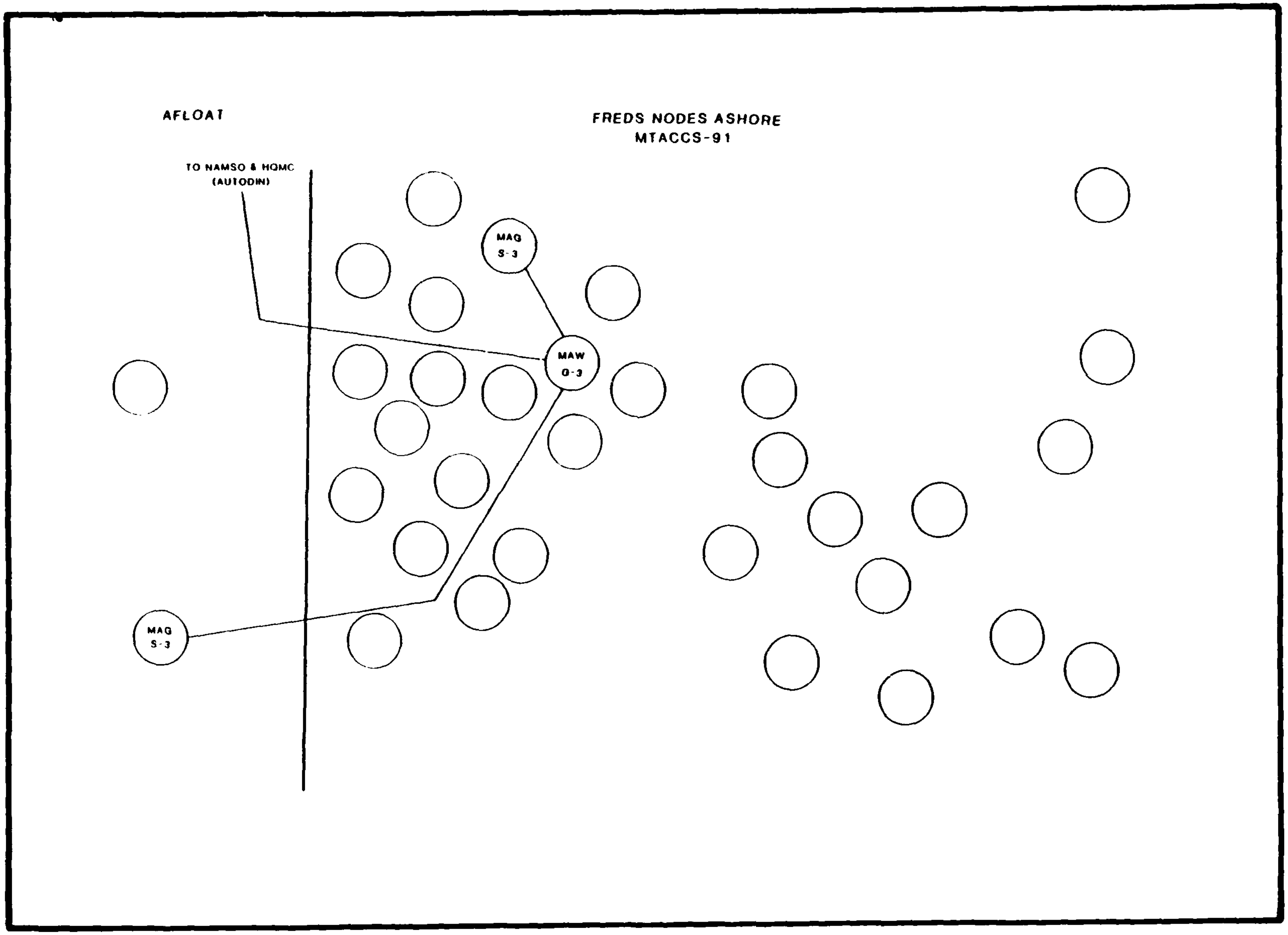


Figure C-33. FREDS Nodes D+5 (AOA MTACCS)

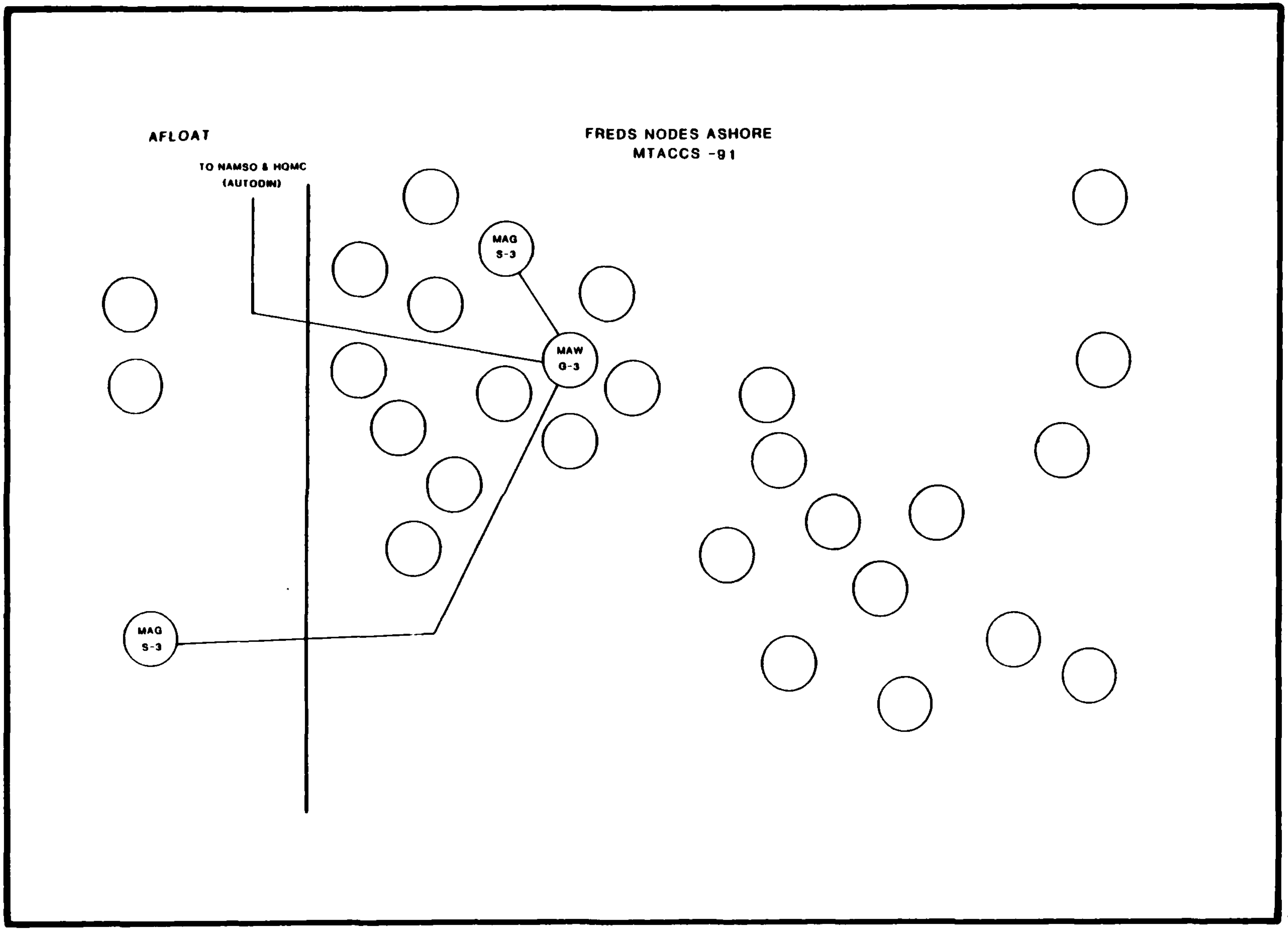


Figure C-34. FREDS Nodes D+11 (AOA MTACCS)

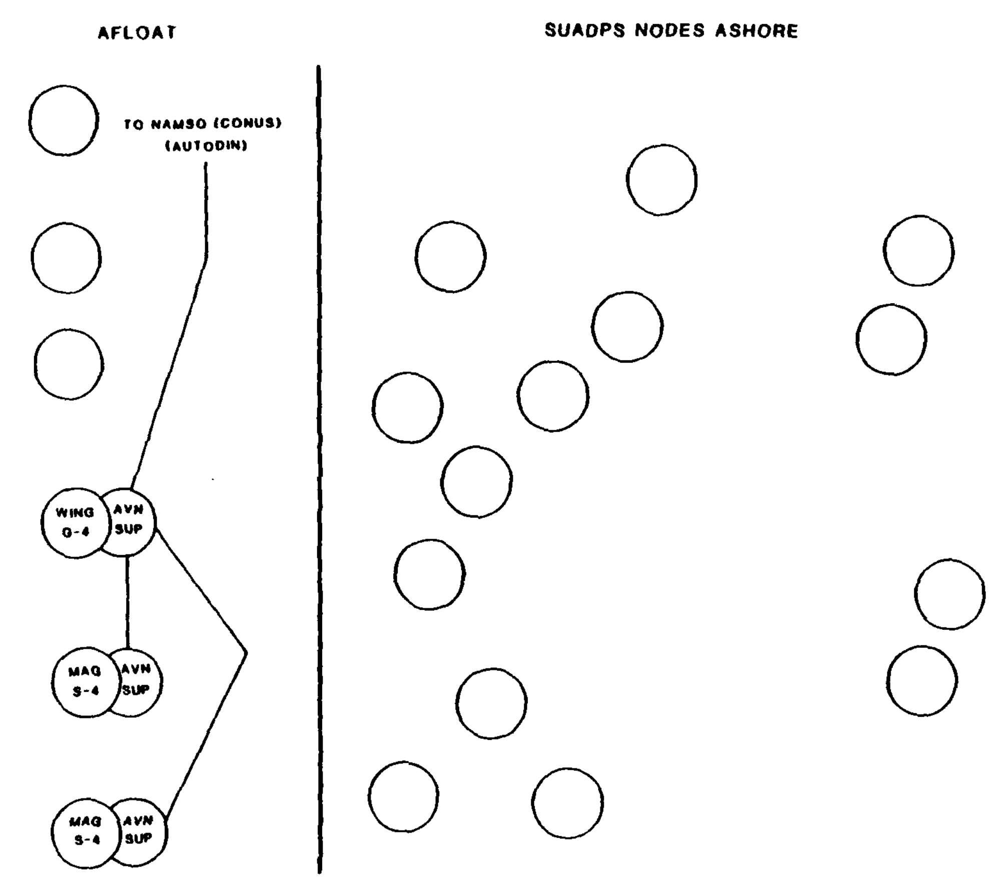


Figure C-35. SUADPS Nodes D-Day (AOA)

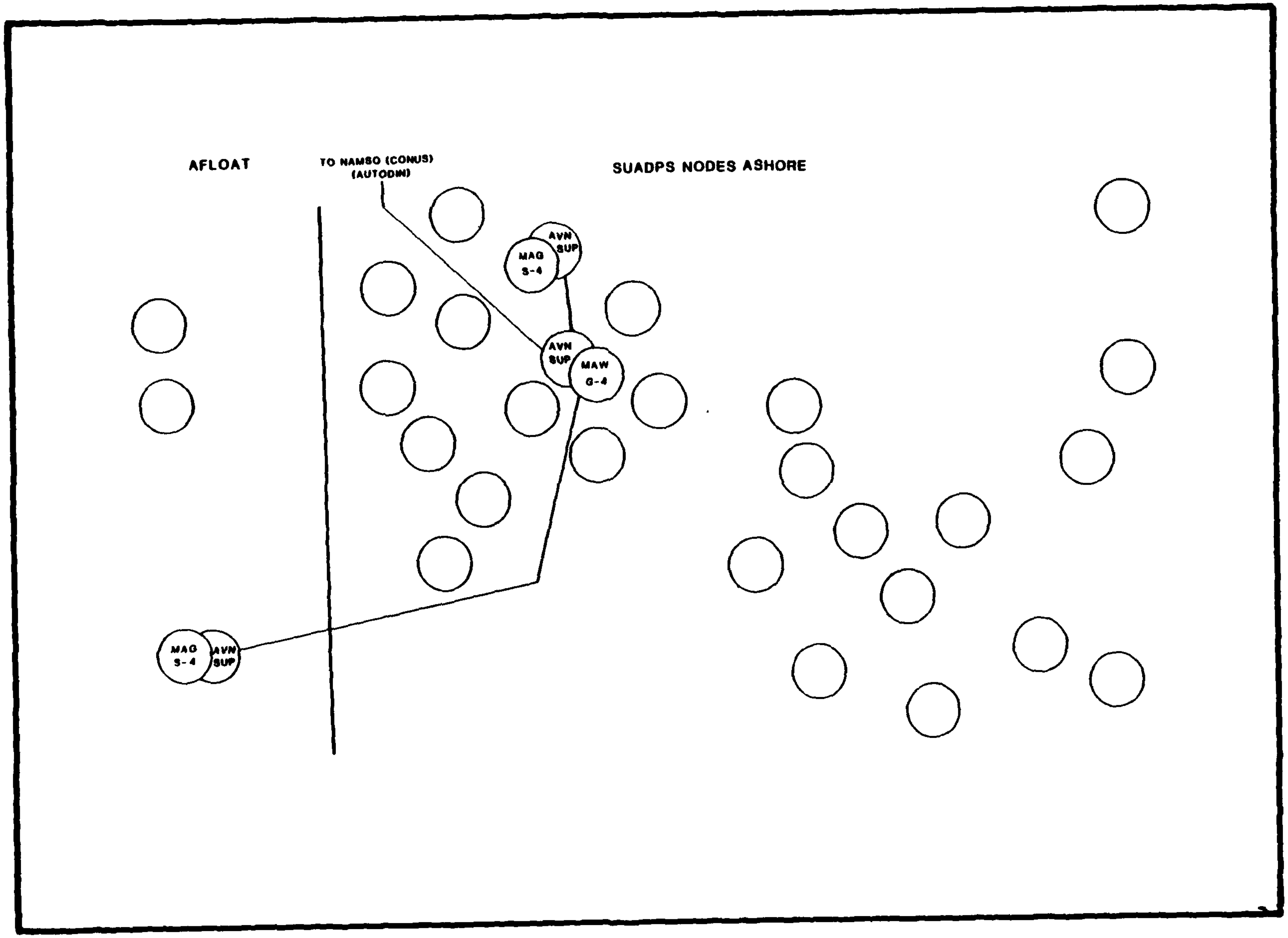


Figure C-36. SUADPS Nodes D+5 (AOA)

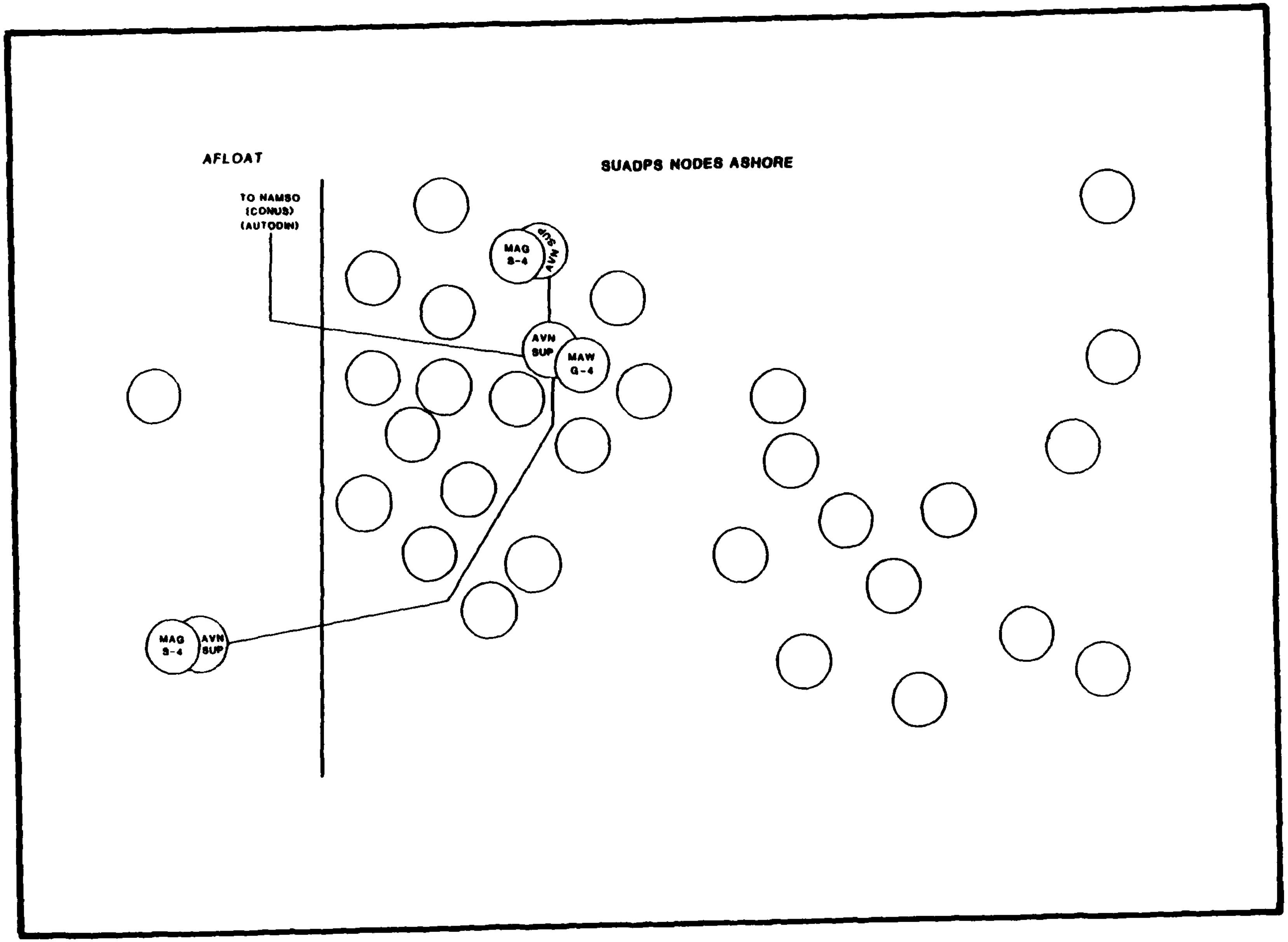


Figure C-37. SUADPS Nodes D+11 (AOA)

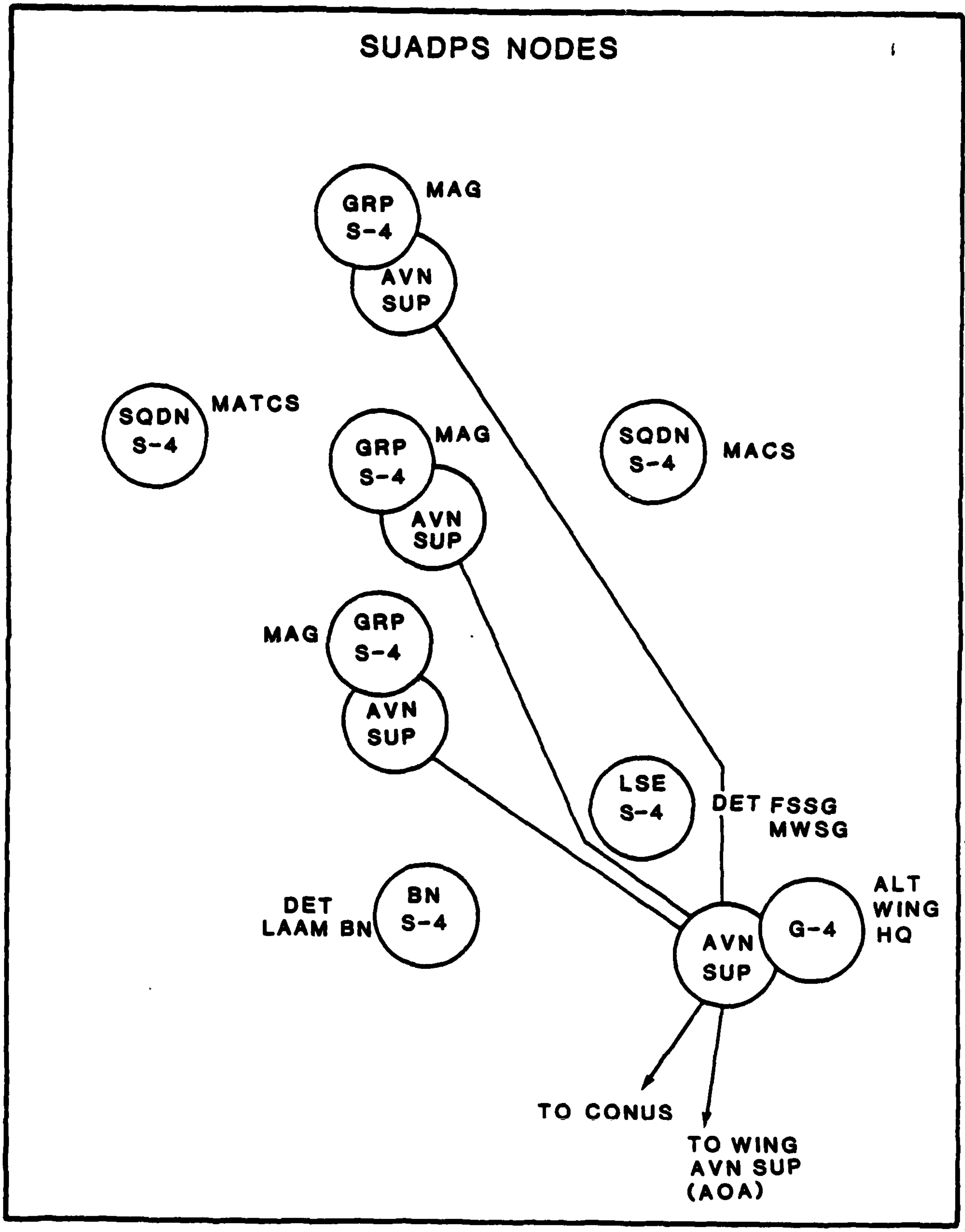


Figure C-38. SUADPS Nodes D-Day to D+11 (TAE)

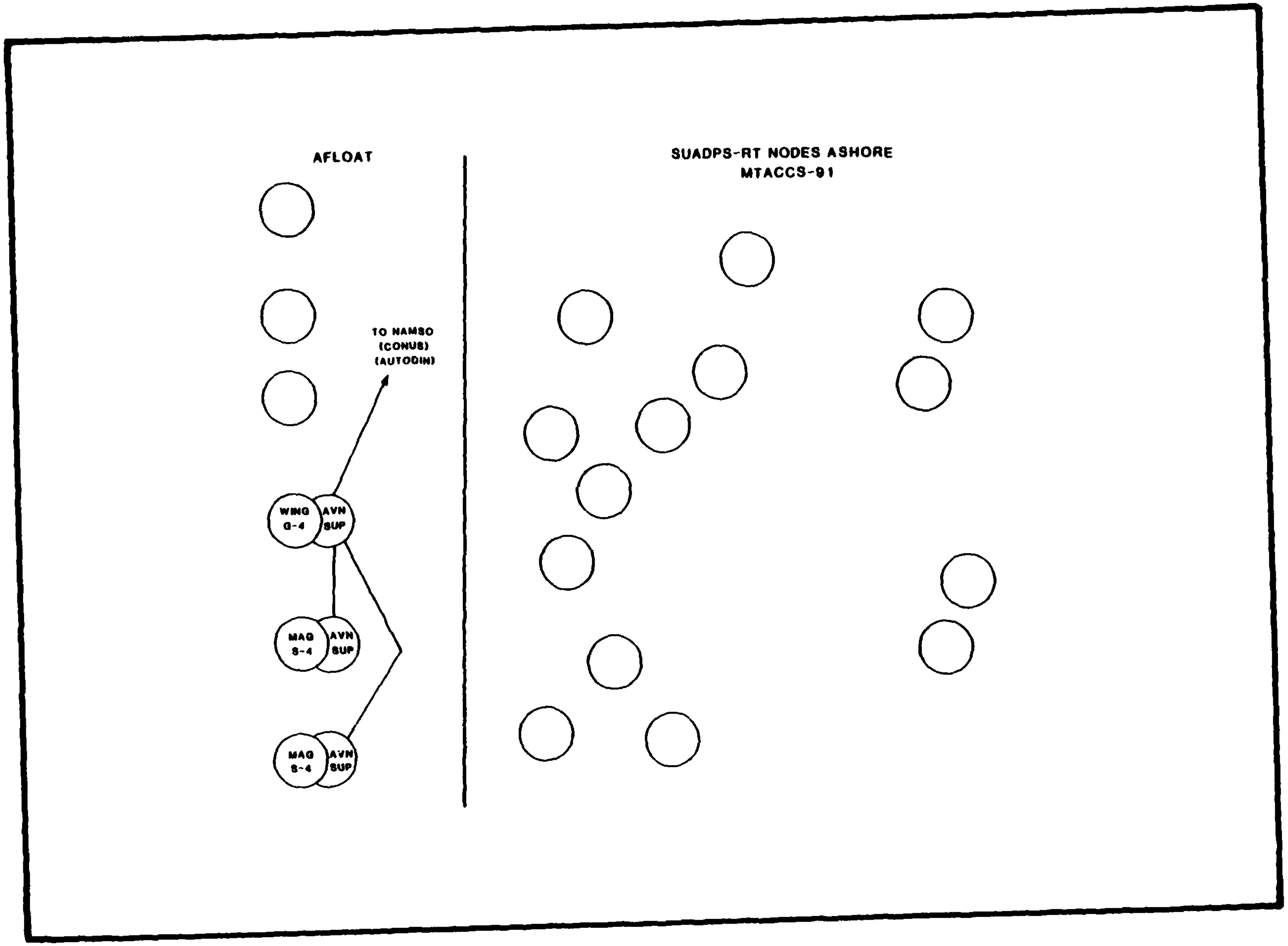


Figure C-39. SUADPS-RT Nodes D-Day (AOA)

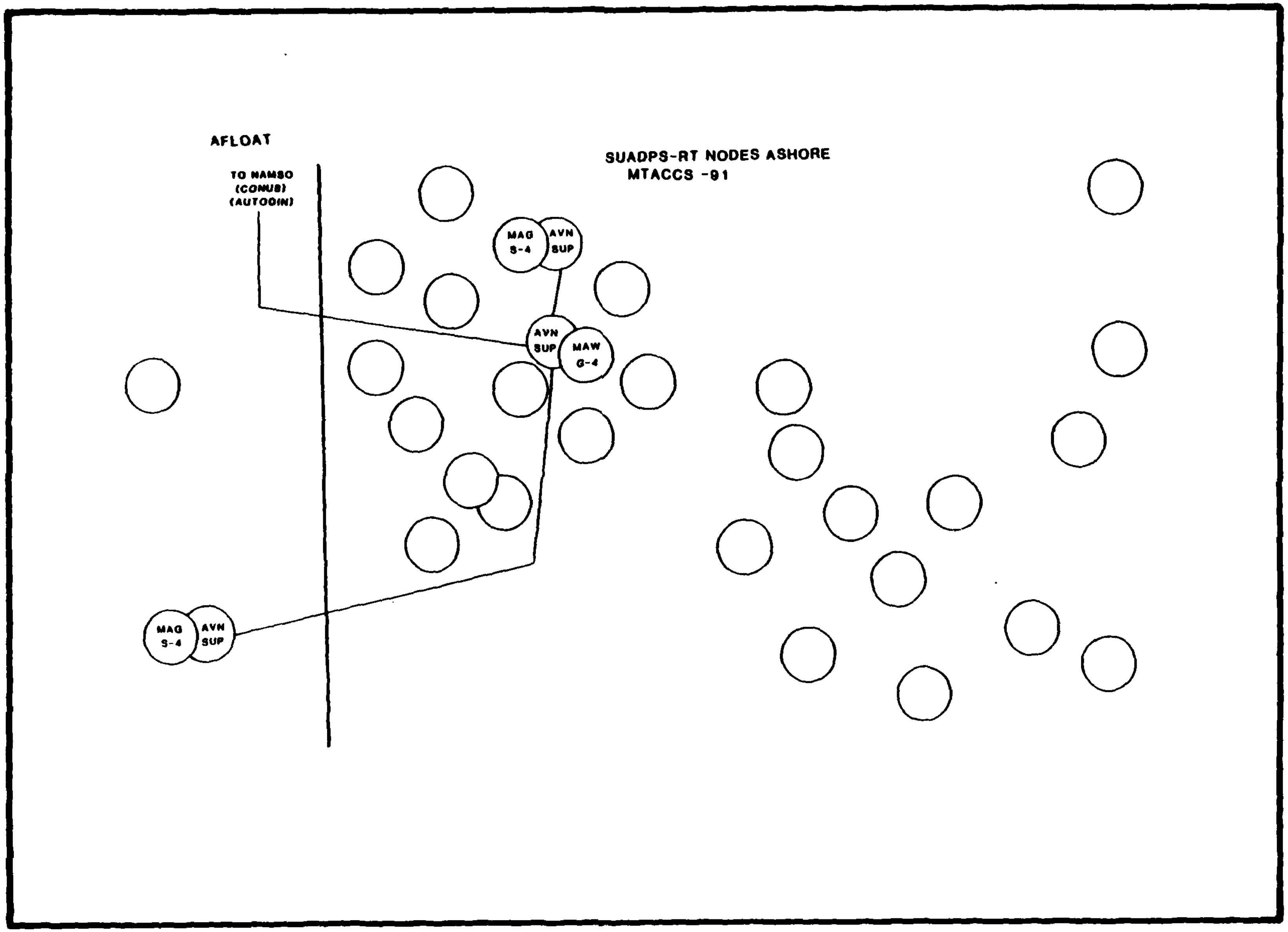


Figure C-40. SUADPS-RT Nodes D+5 (AOA)

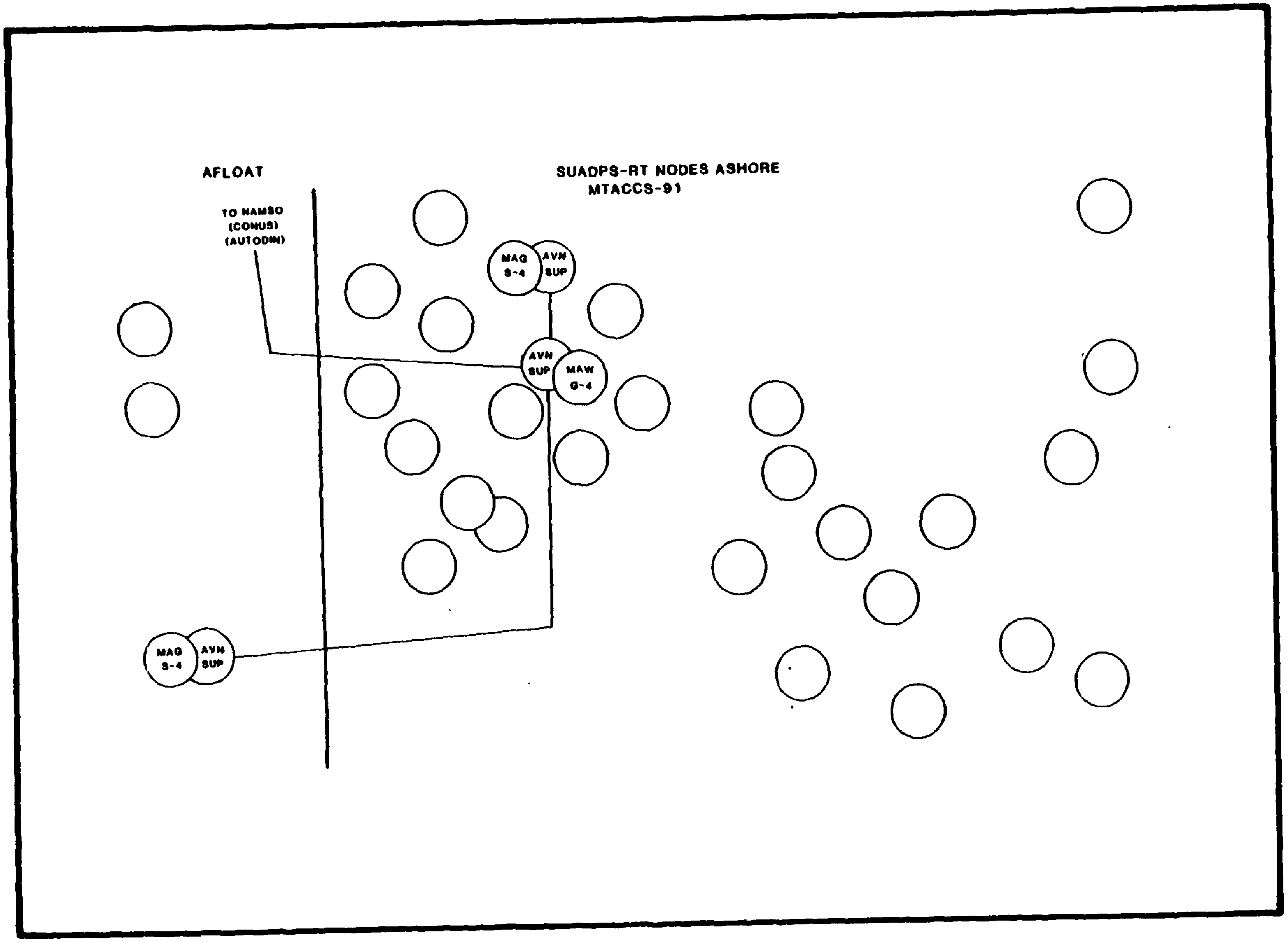


Figure C-41. SUADPS-RT Nodes D+11 (AOA)

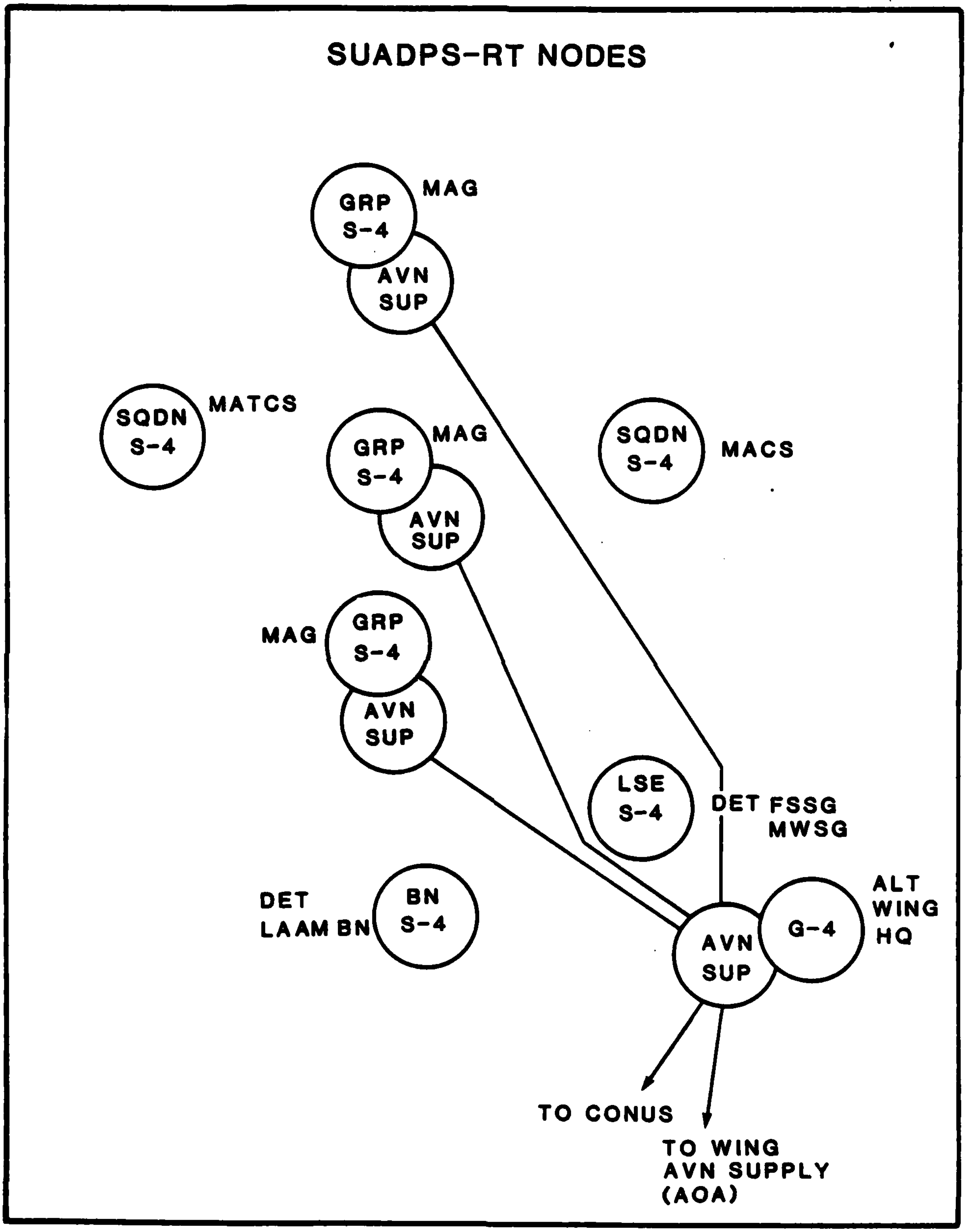


Figure C-42. SUADPS-RT Nodes D-Day to D+11 (TAE)

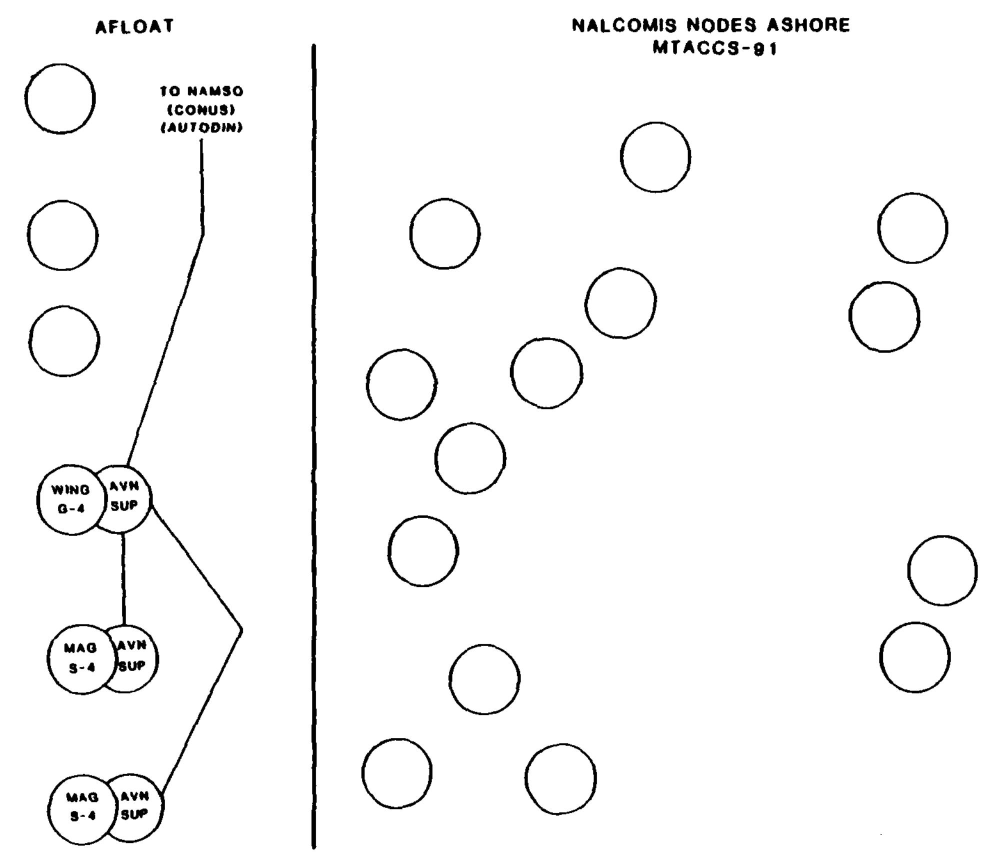


Figure C-43. NALCOMIS Nodes D-Day (AOA)

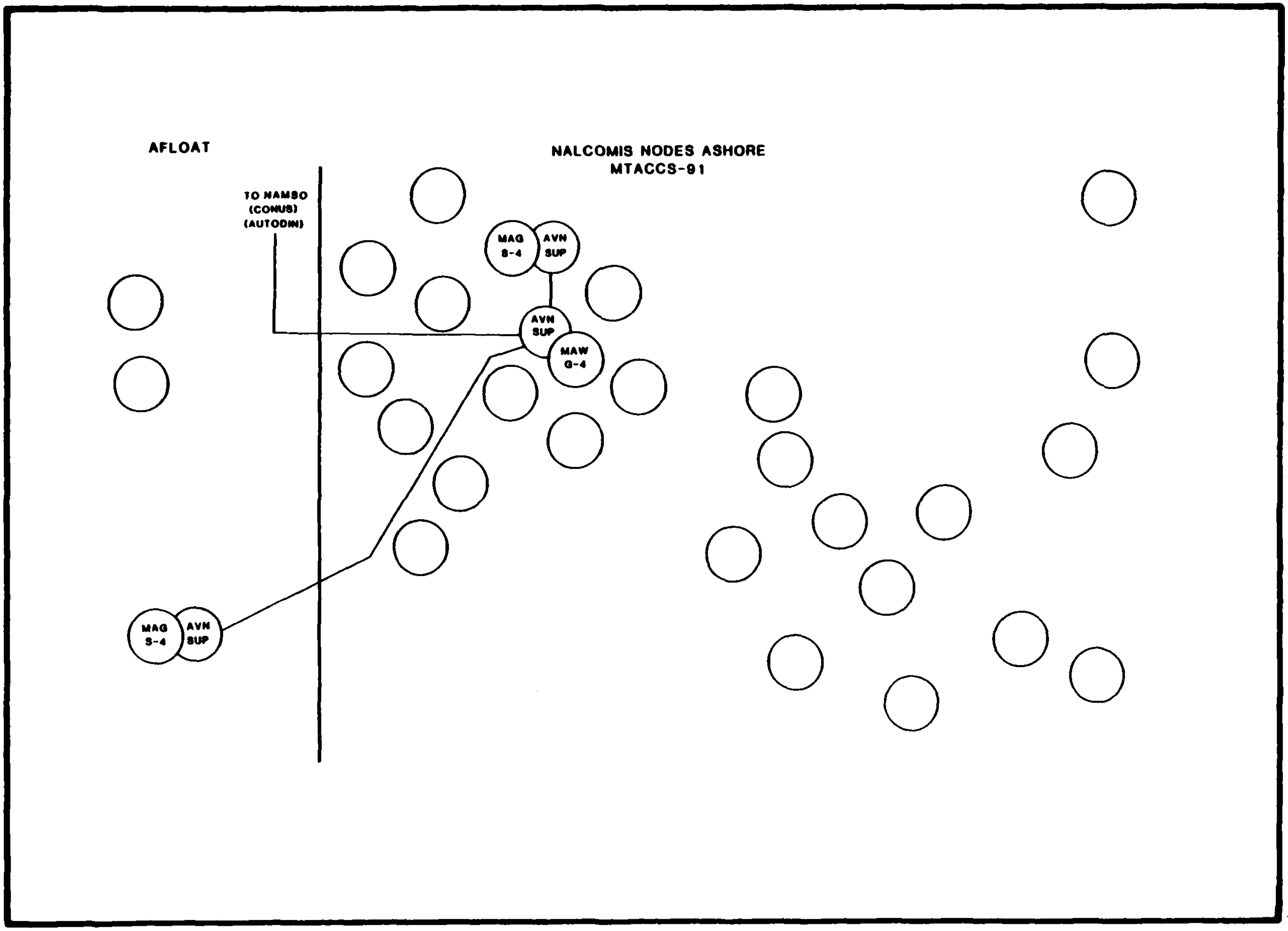


Figure C-44. NALCOMIS Nodes D+5 (AOA)

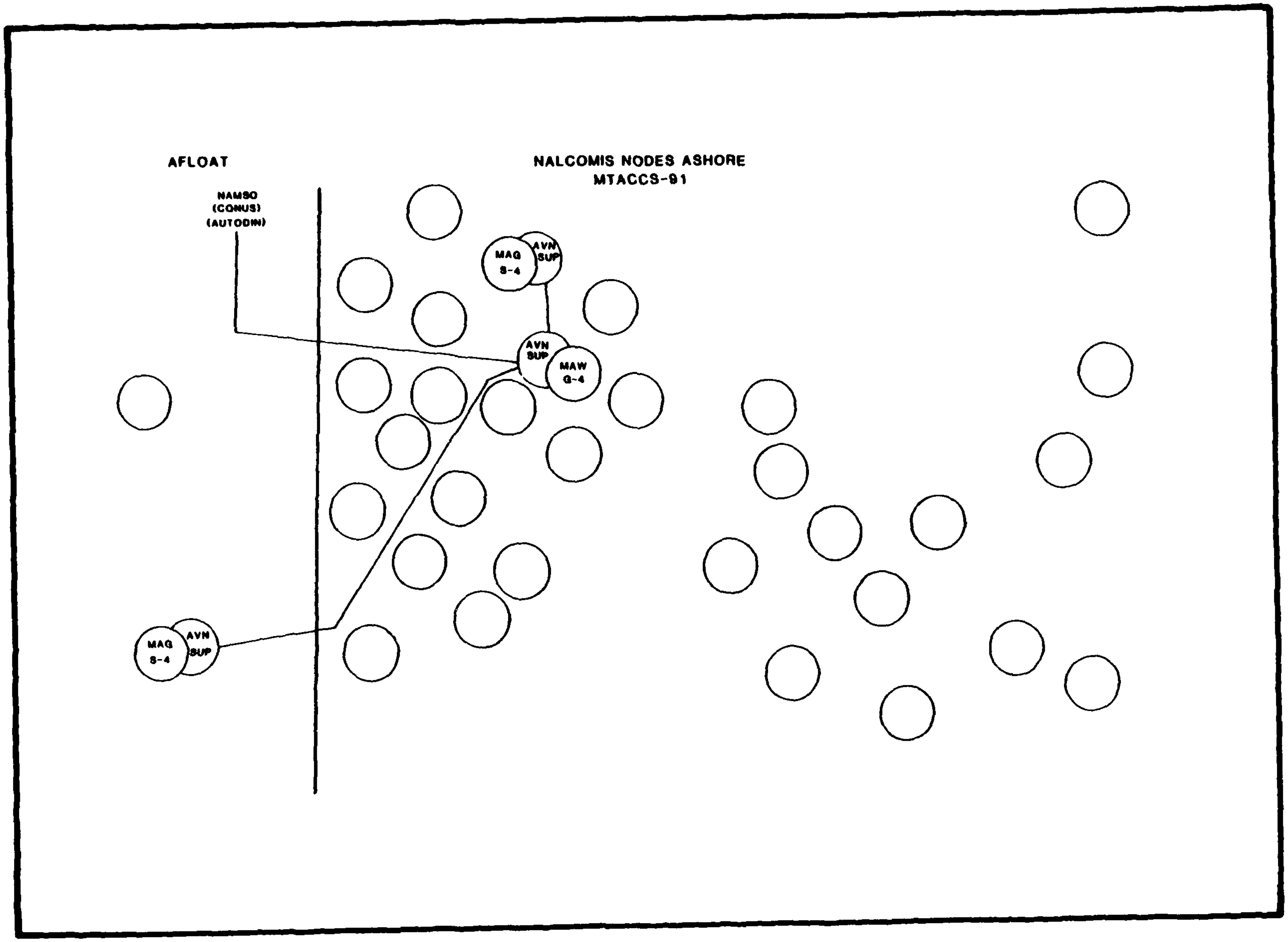


Figure C-45. NALCOMIS Nodes D+11 (AOA)

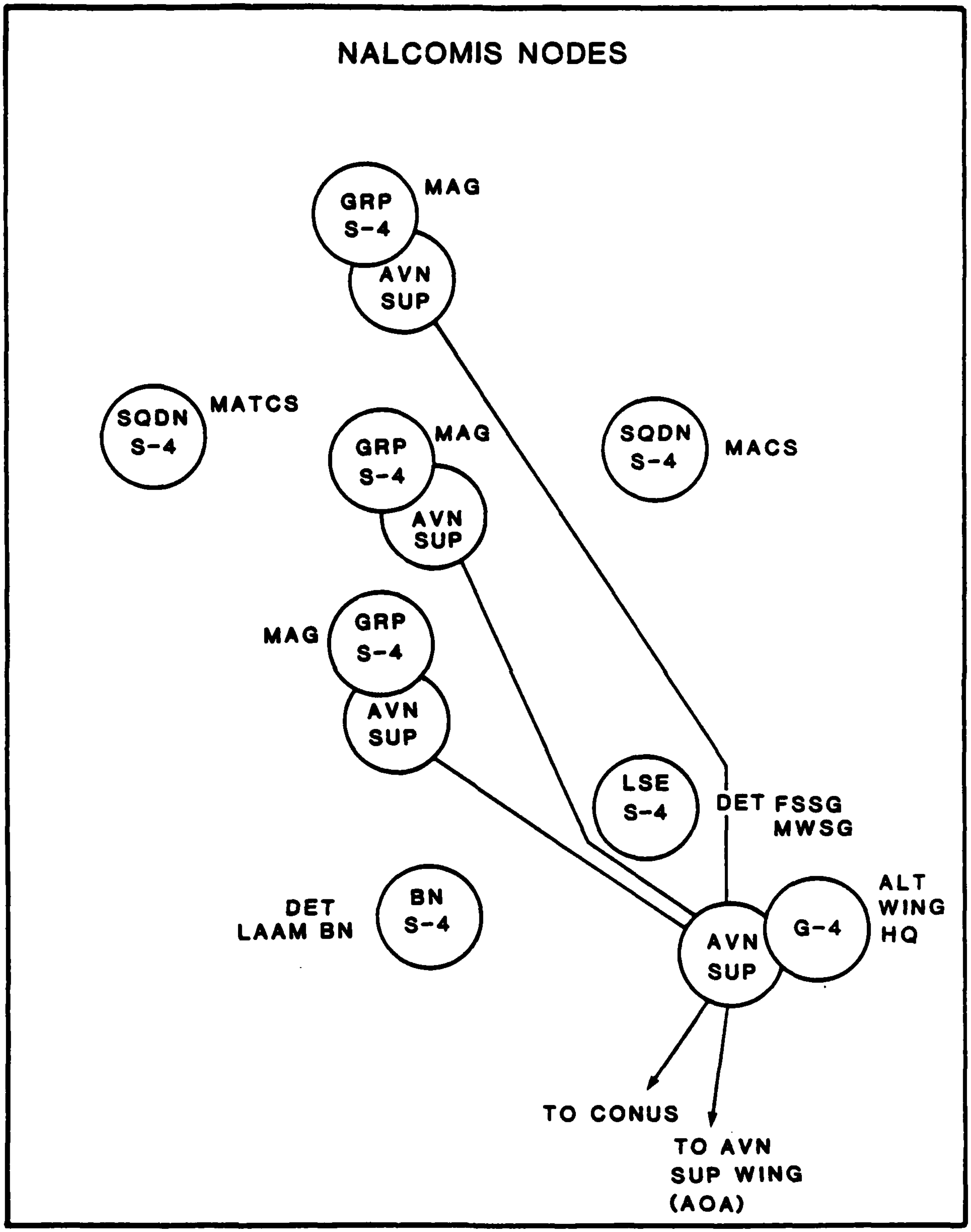


Figure C-46. NALCOMIS Nodes D-Day to D+11 (TAE)

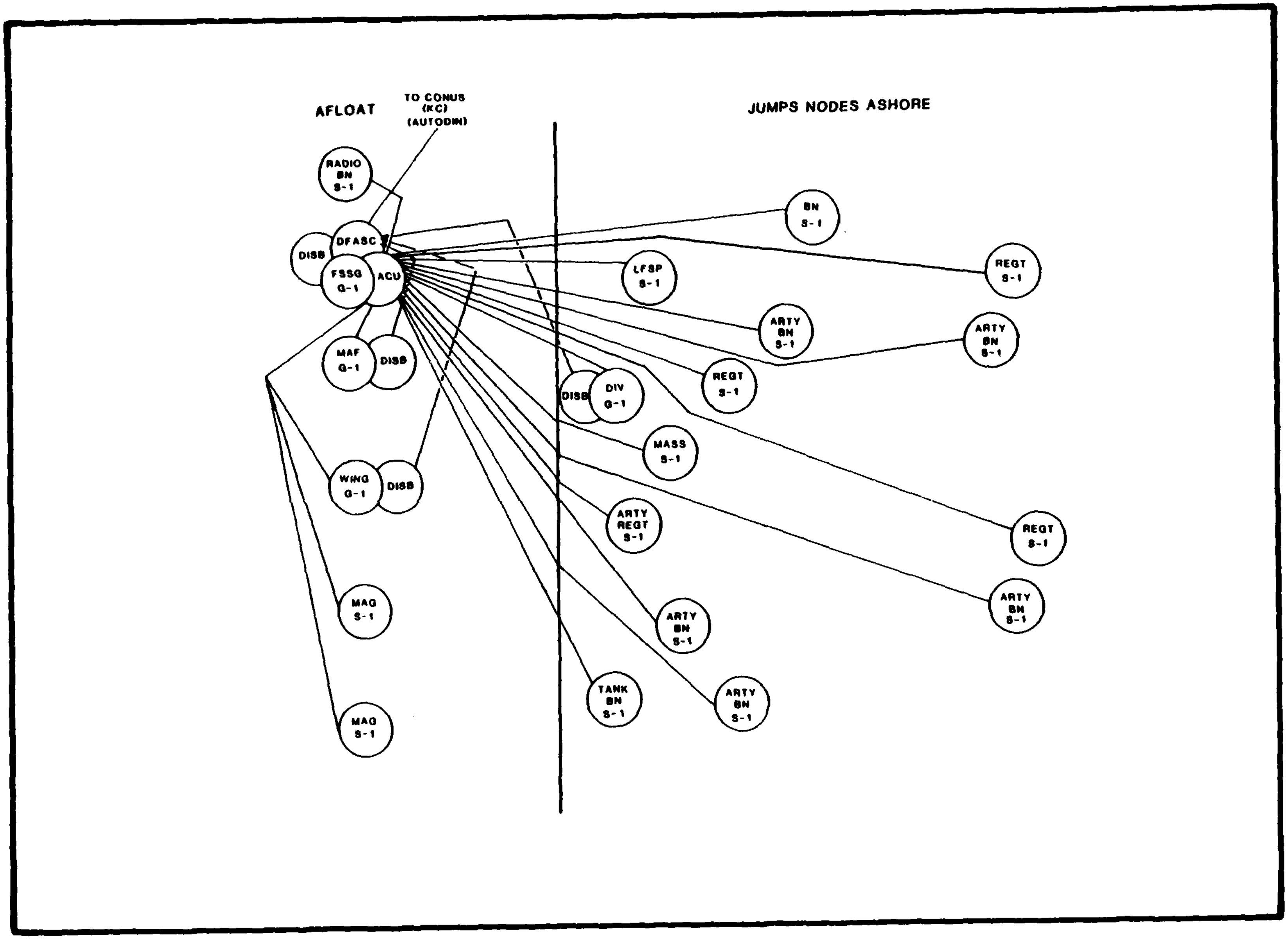


Figure C-47. JUMPS Nodes D-Day (AOA)

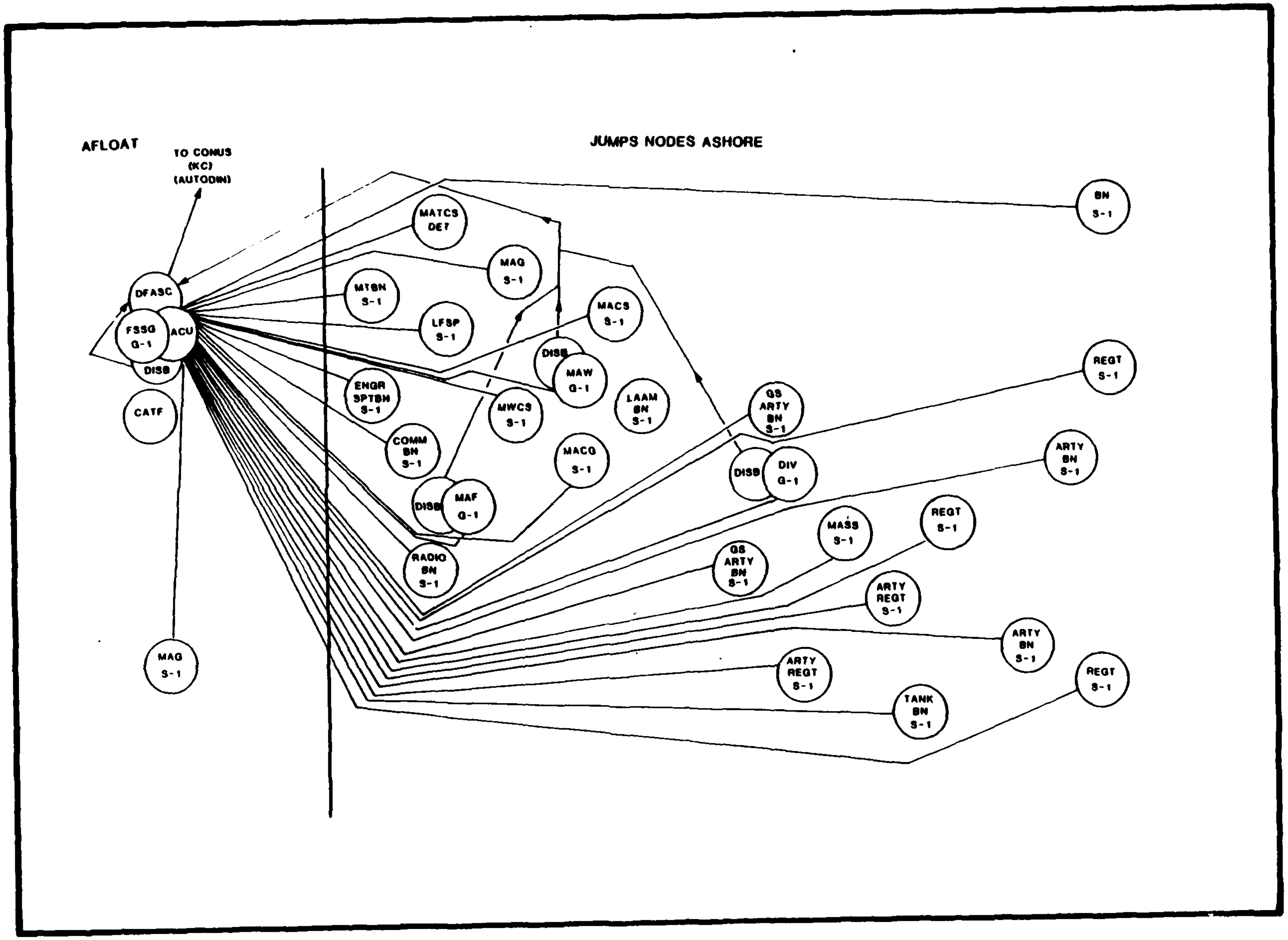


Figure C-48. JUMPS Nodes D+5 (AOA)

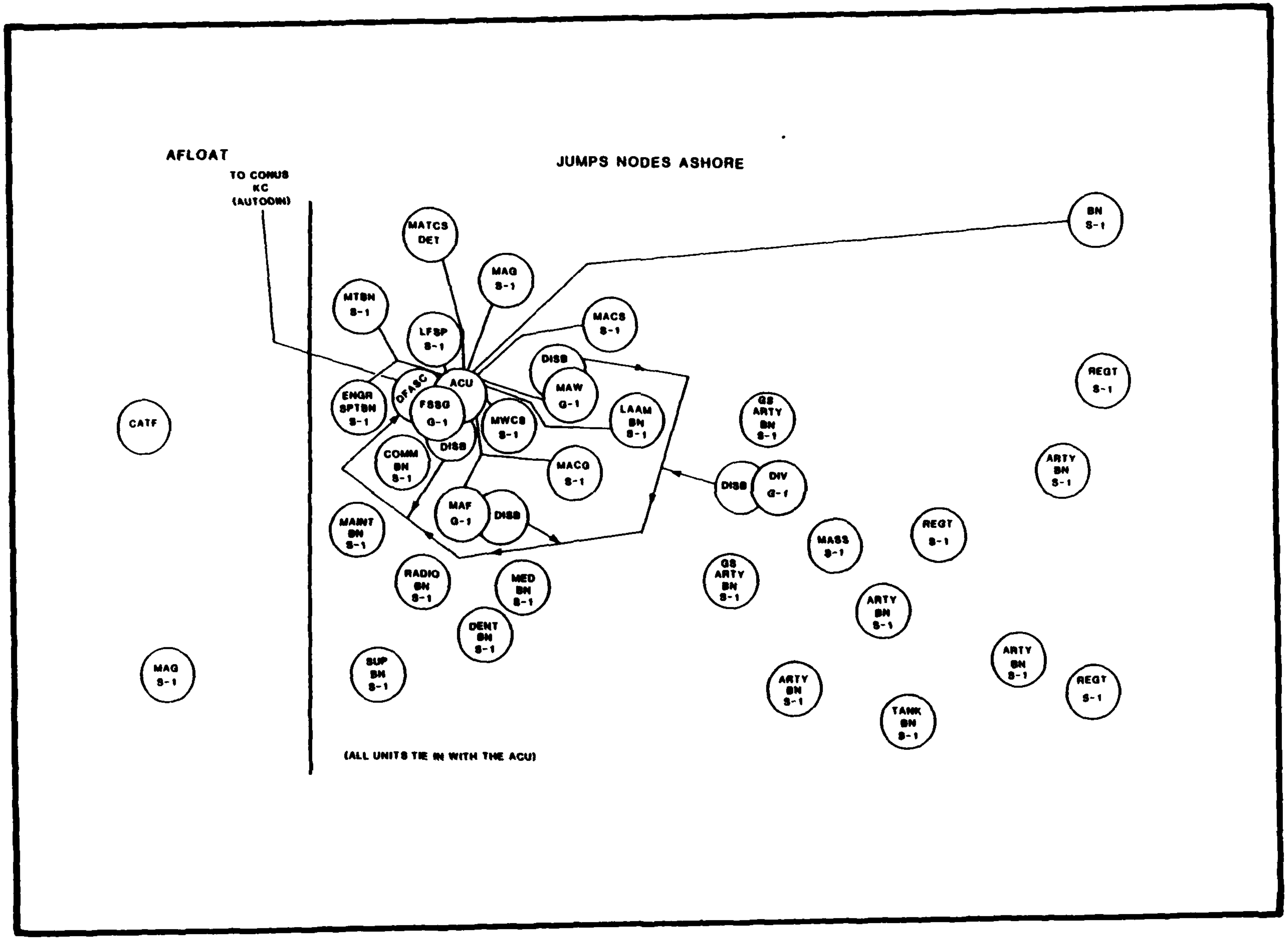


Figure C-49. JUMPS Nodes D+11 (AOA)

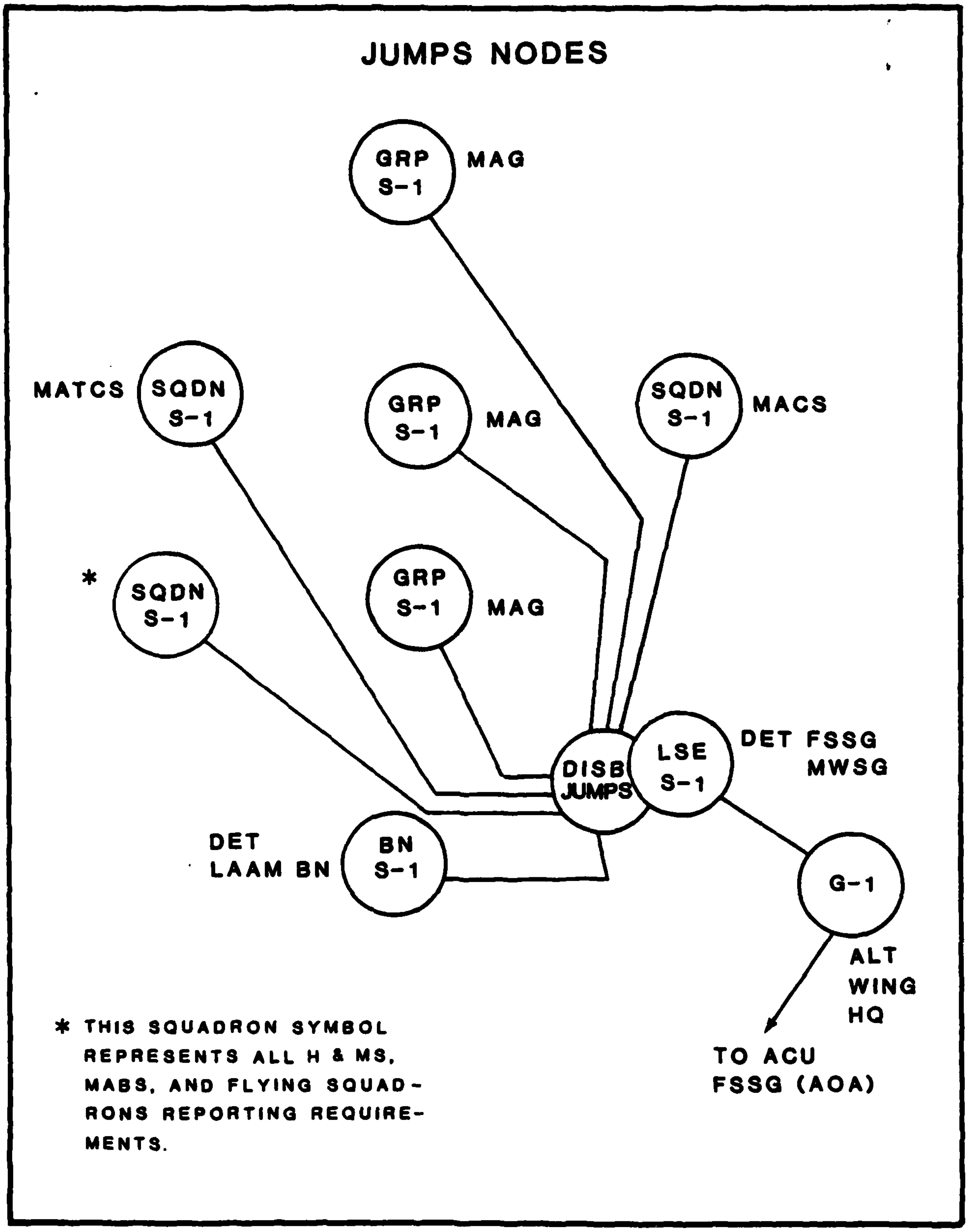


Figure C-50. JUMPS Nodes D-Day to D+11 (TAE)

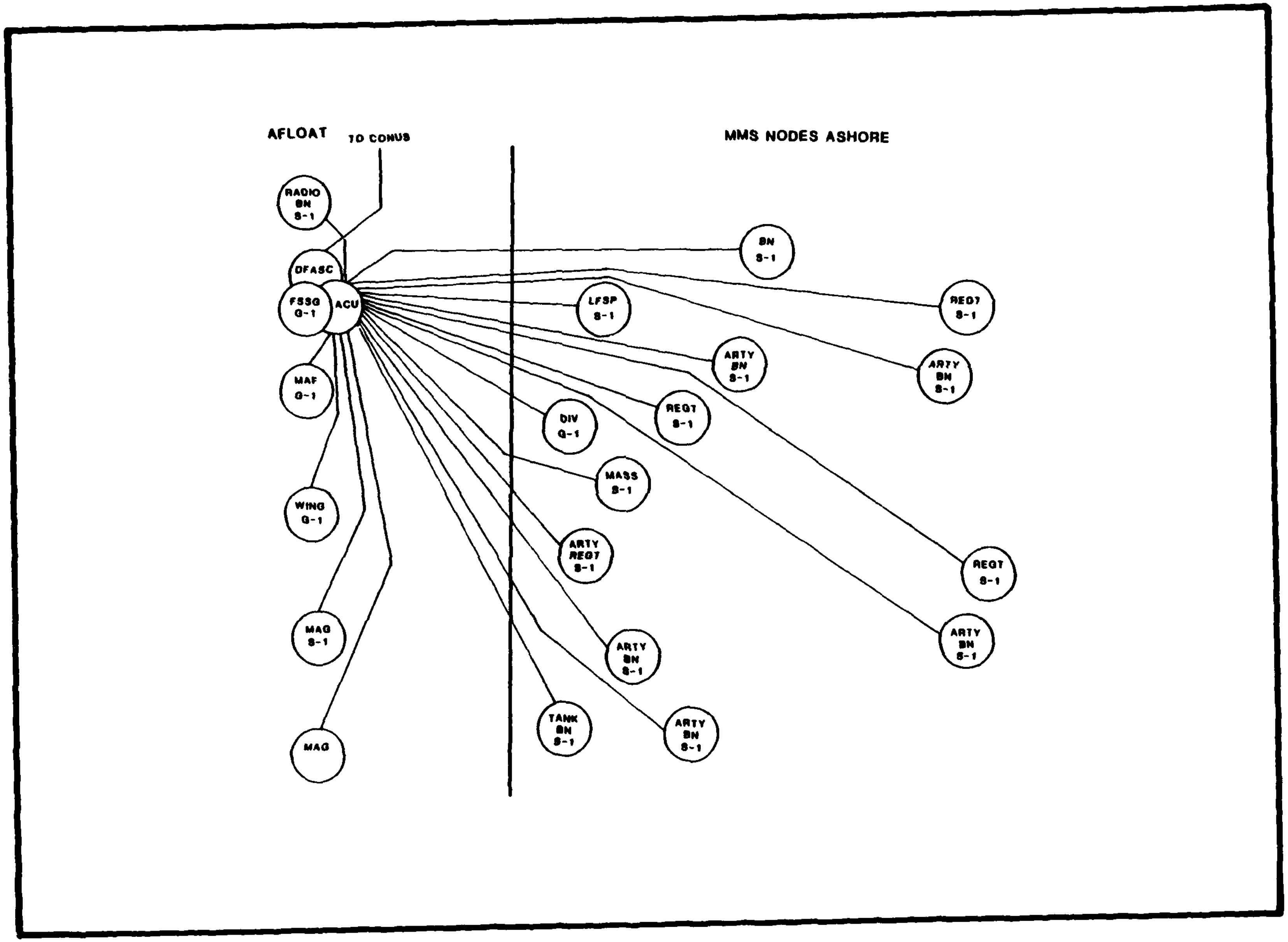


Figure C-51. MMS Nodes D-Day (AOA)

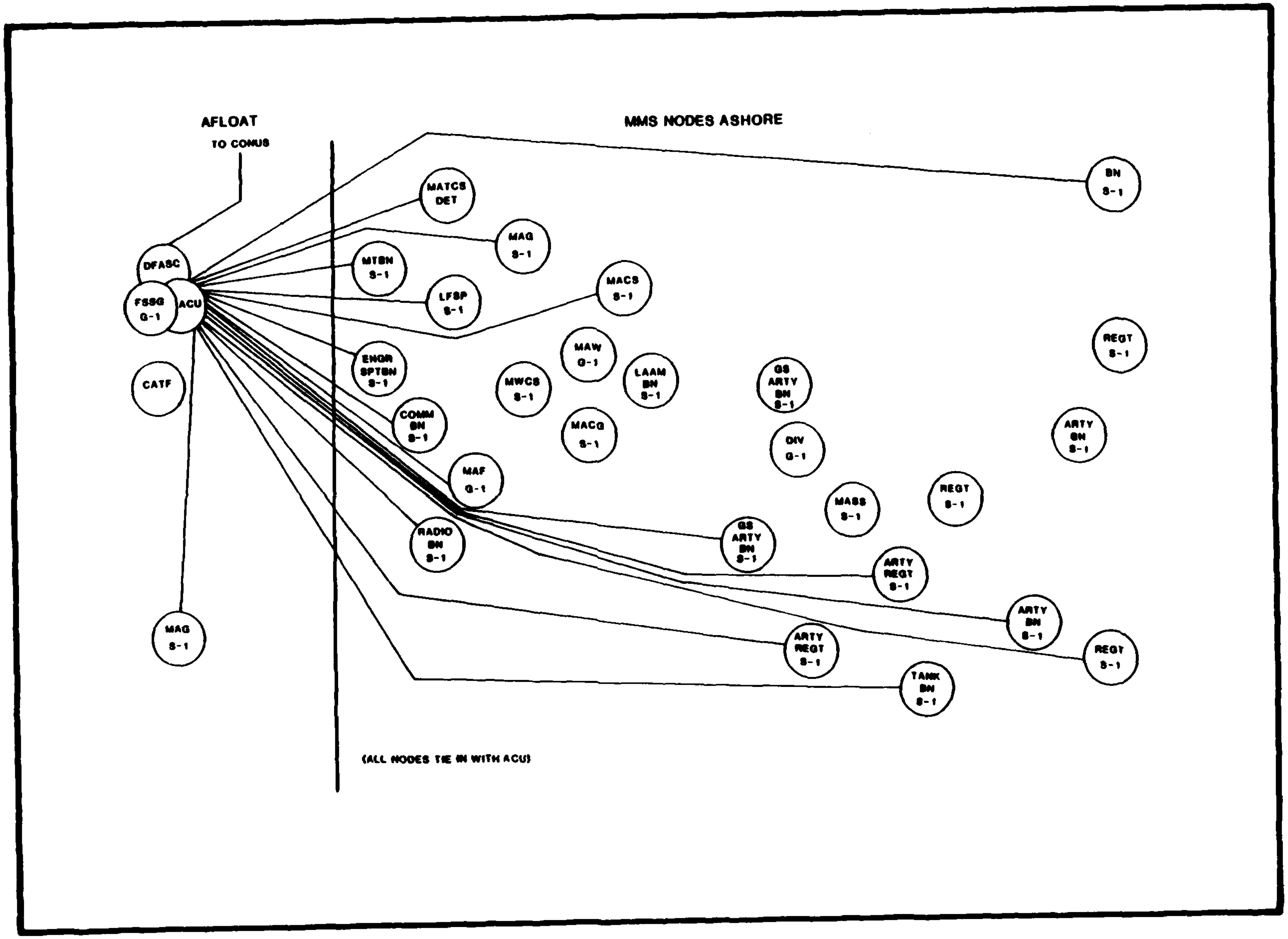


Figure C-52. MMS Nodes D+5 (AOA)

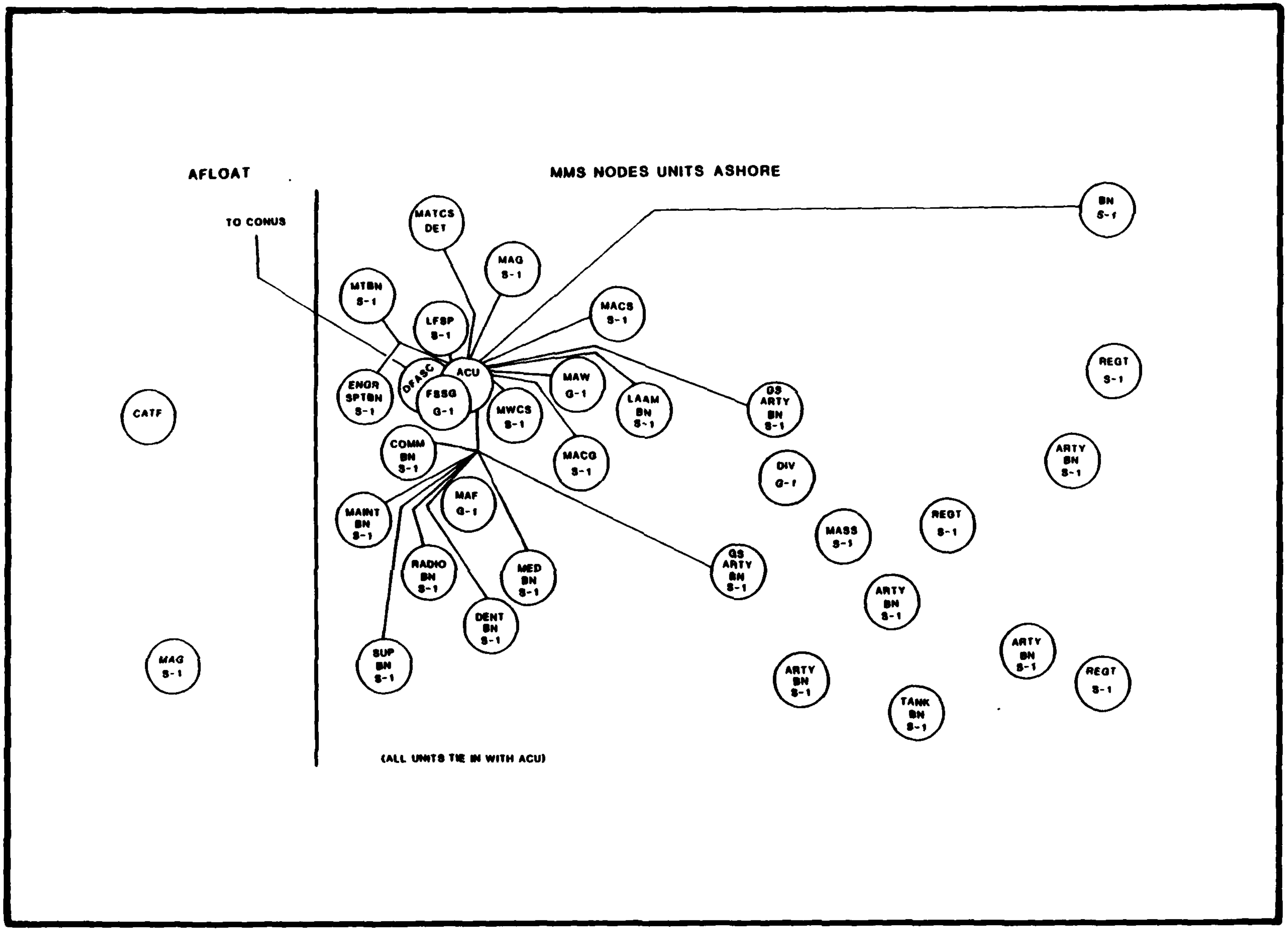


Figure C-53. MMS Nodes D+11 (AOA)

MMS NODES

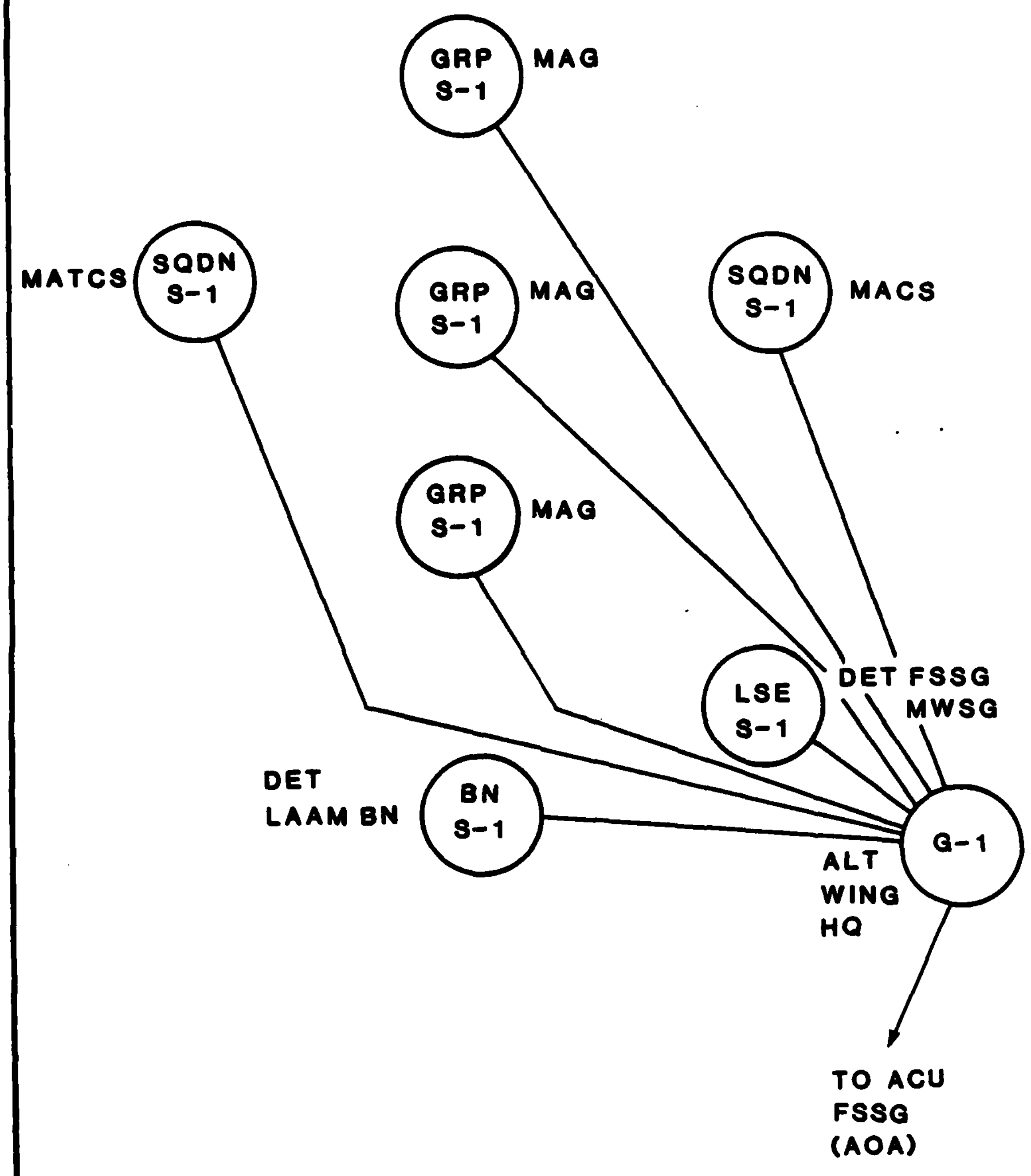


Figure C-54. MMS Nodes D-Day to D+11 (TAE)

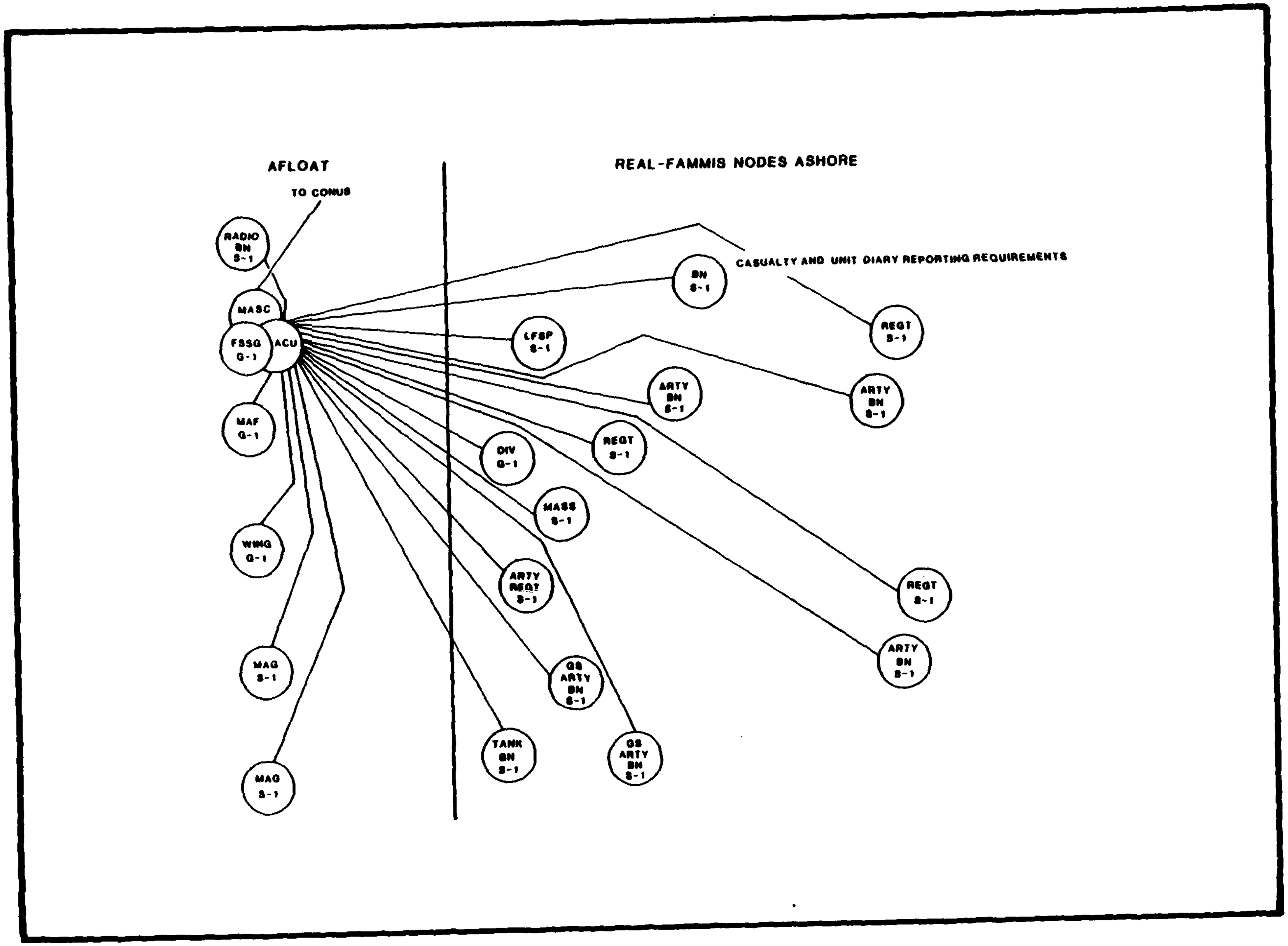


Figure C-55. REAL-FAMMIS Nodes D-Day (AOA)

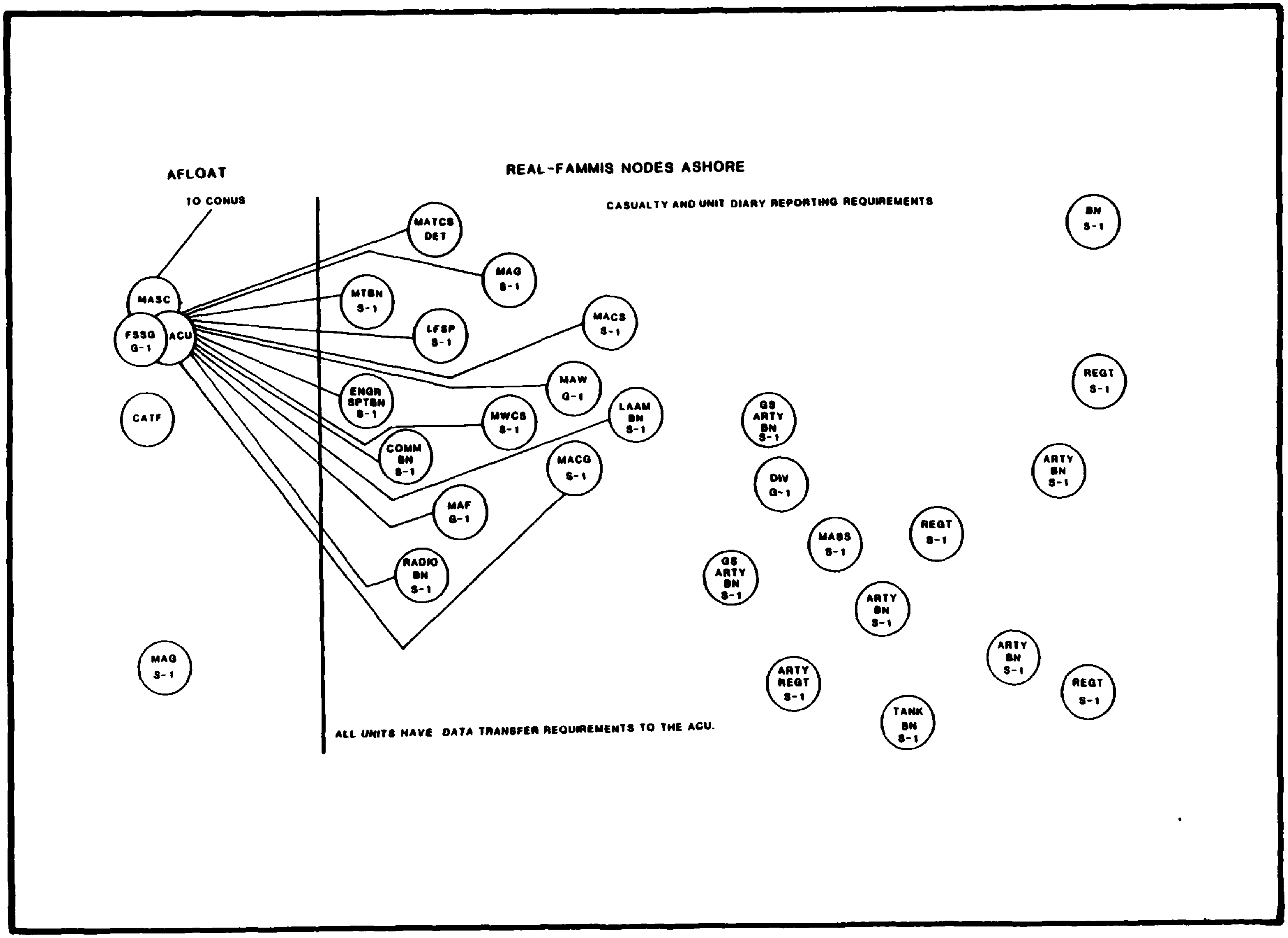


Figure C-56. REAL-FAMMIS Nodes D+5 (AOA)

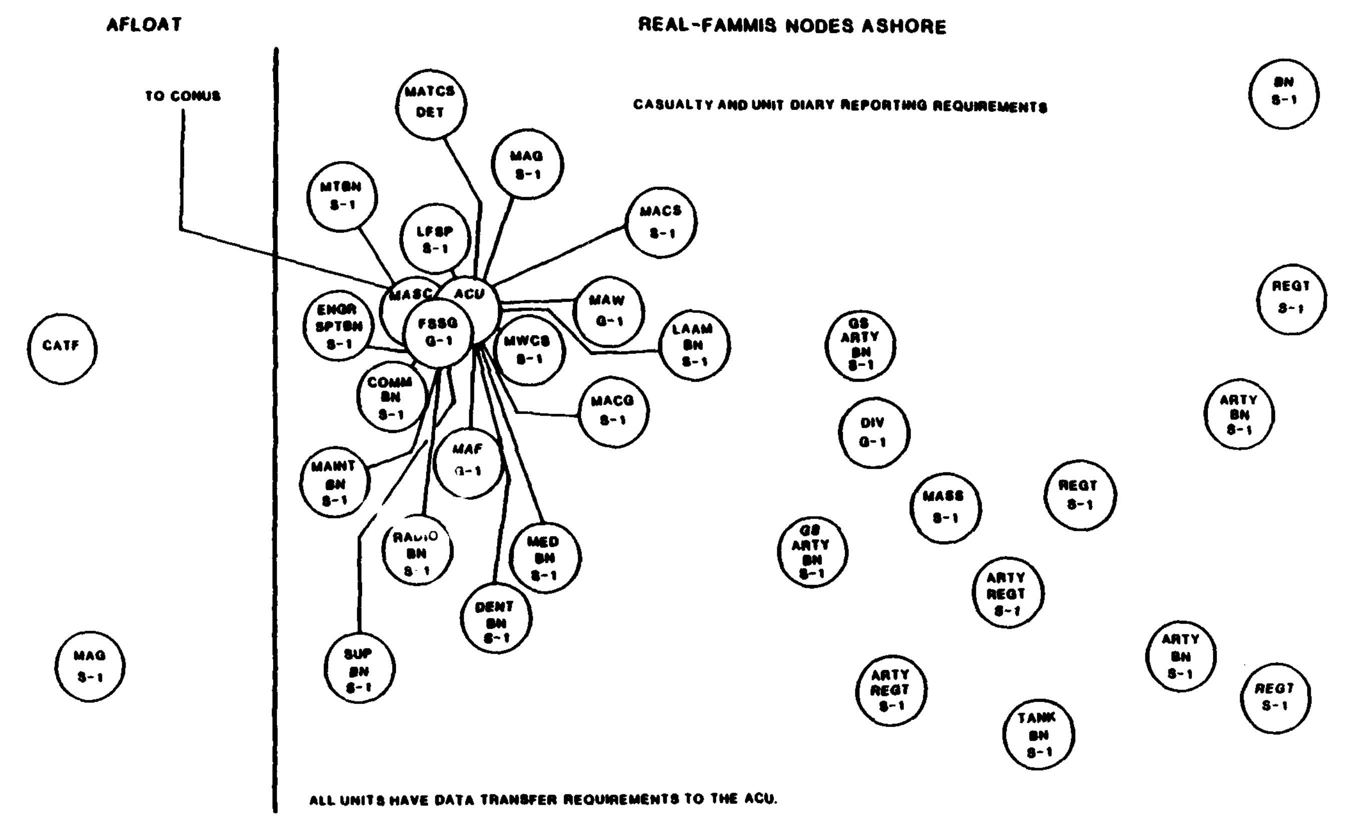


Figure C-57. REAL-FAMMIS Nodes D+11 (AOA)

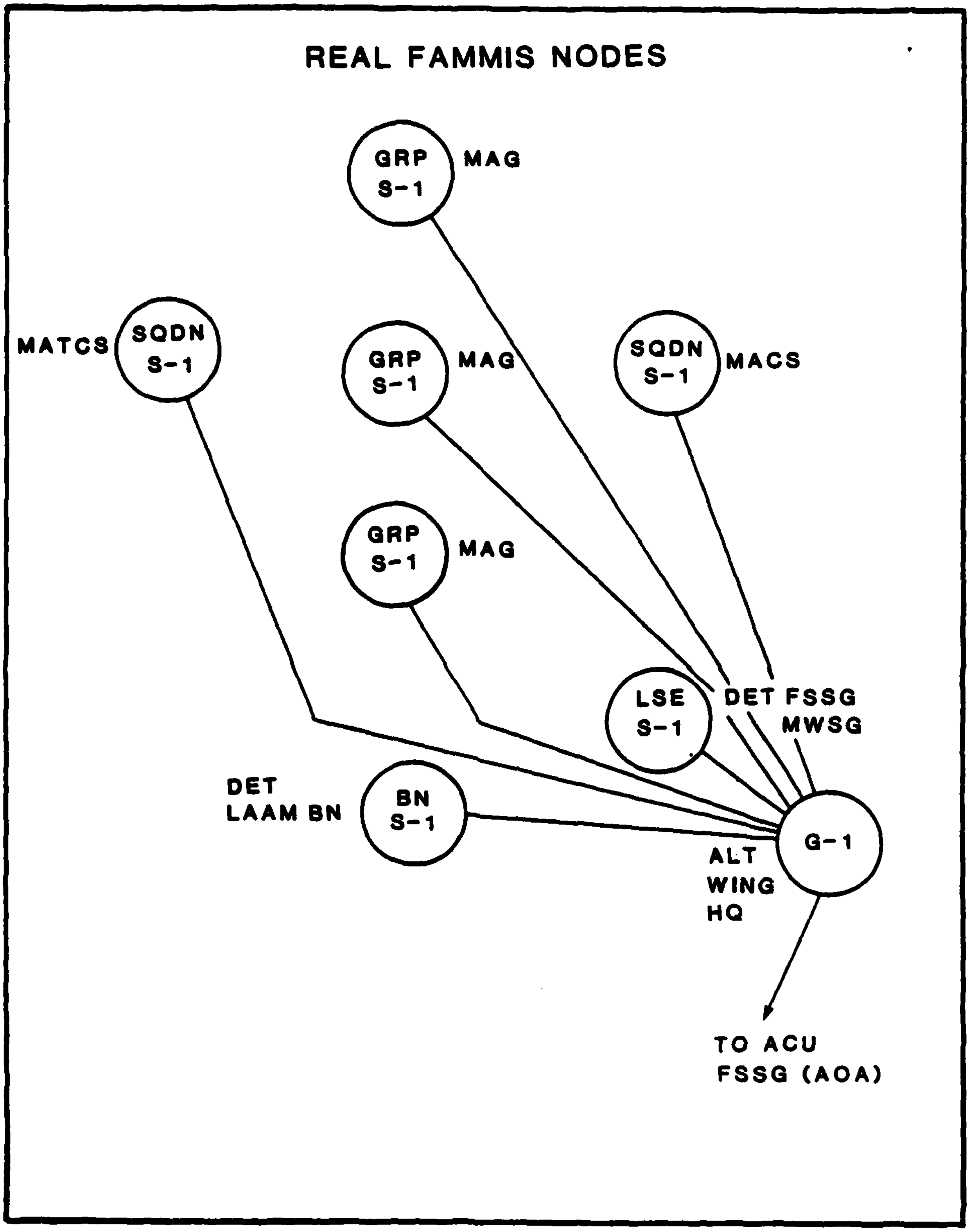


Figure C-58. REAL-FAMMIS Nodes D-Day to D+11 (TAE)

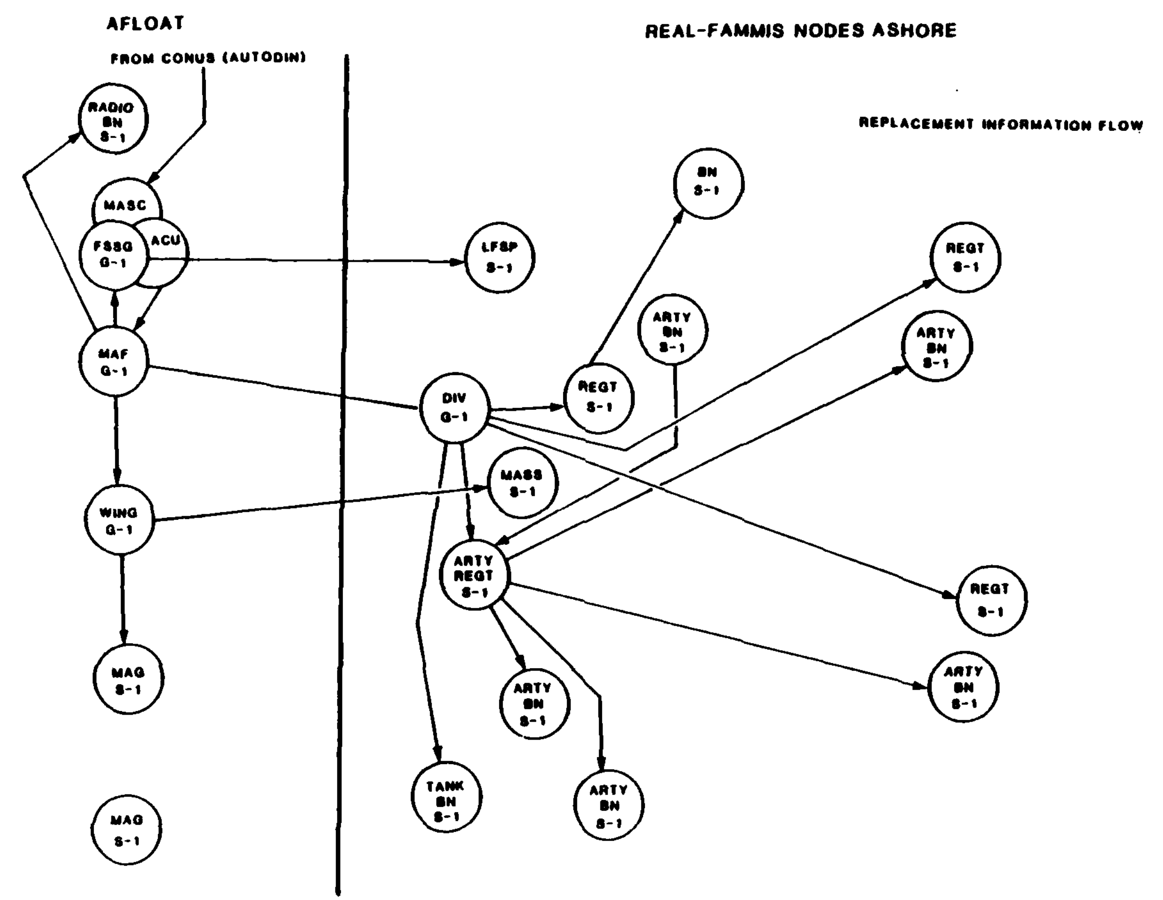


Figure C-59. REAL-FAMMIS Nodes D-Day (AOA)

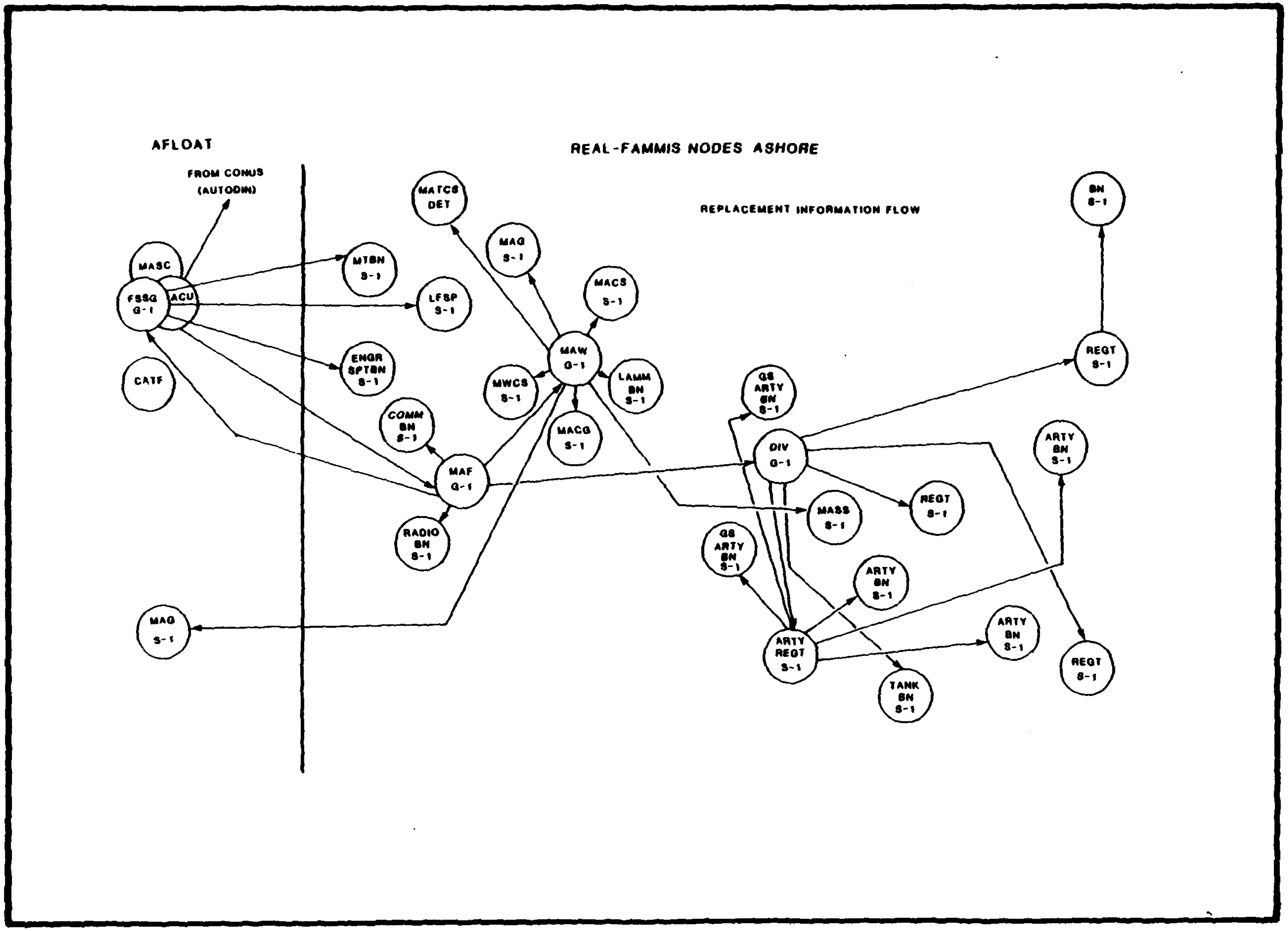


Figure C-60. REAL-FAMMIS Nodes D+5 (AOA)

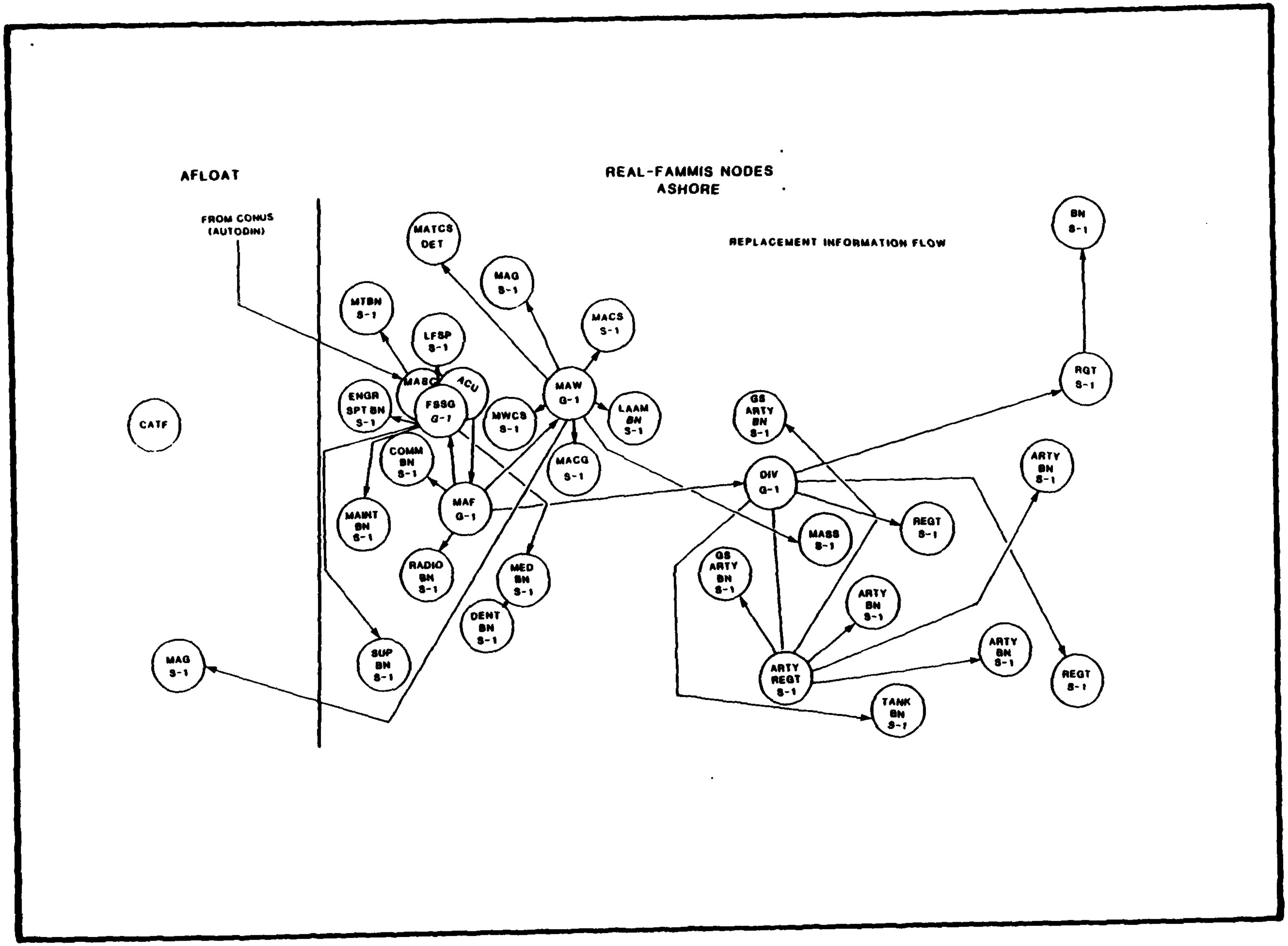


Figure C-61. REAL-FAMMIS Nodes D+11 (AOA)

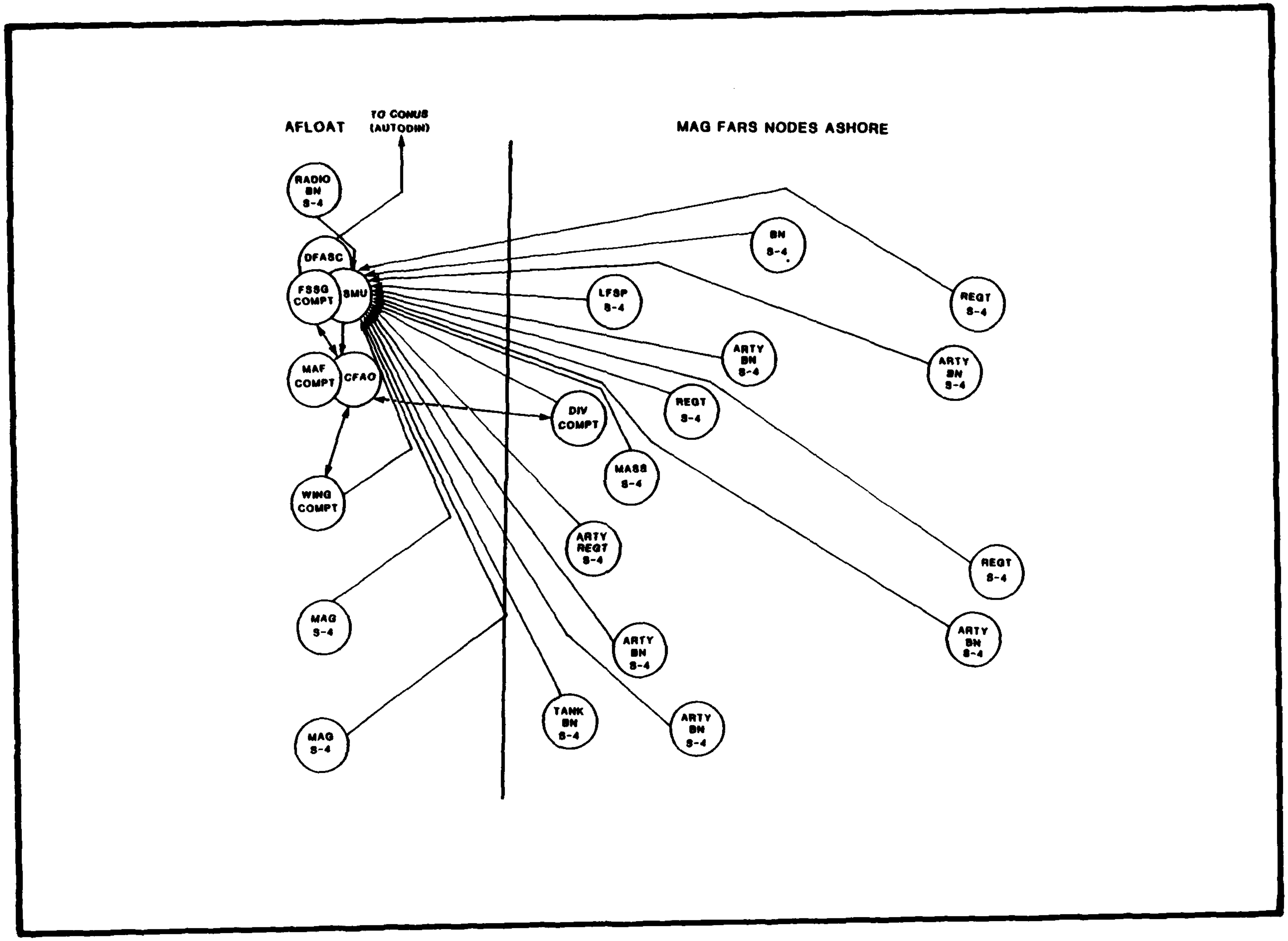


Figure C-62. MAG FARS Nodes D-Day (AOA)

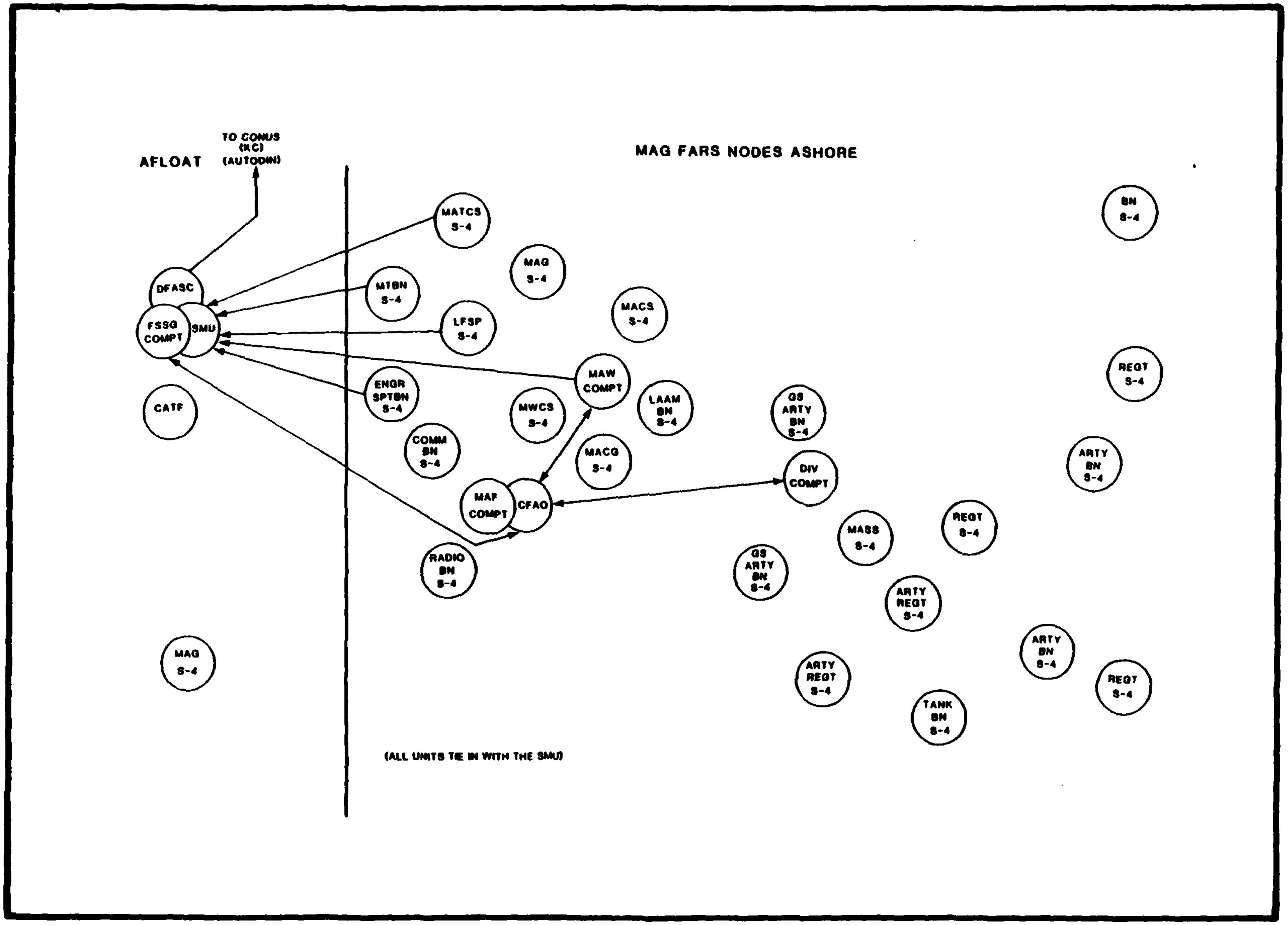


Figure C-63. MAG FARS Nodes D+5 (AOA)

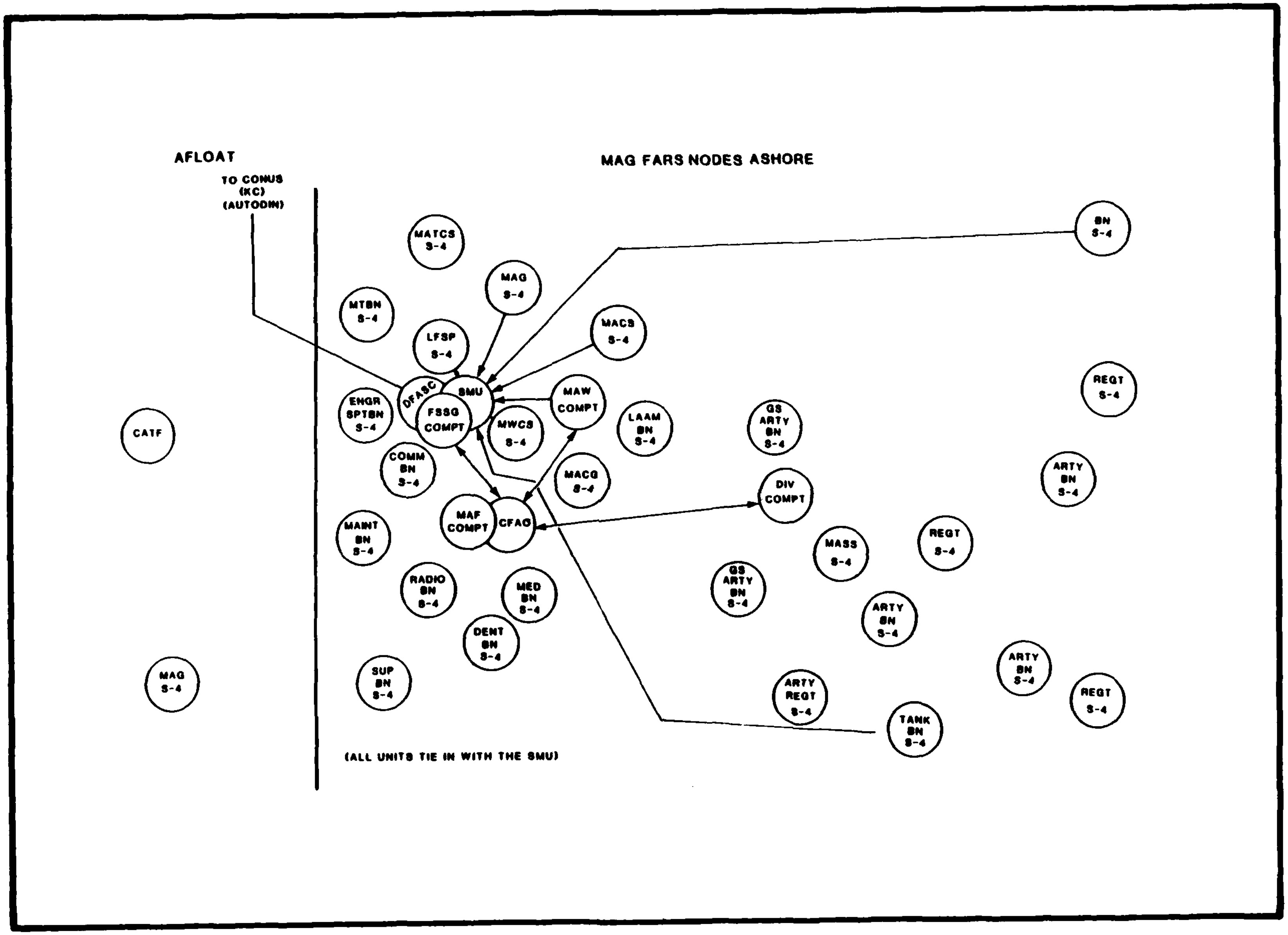


Figure C-64. MAG FARS Nodes D+11 (AOA)

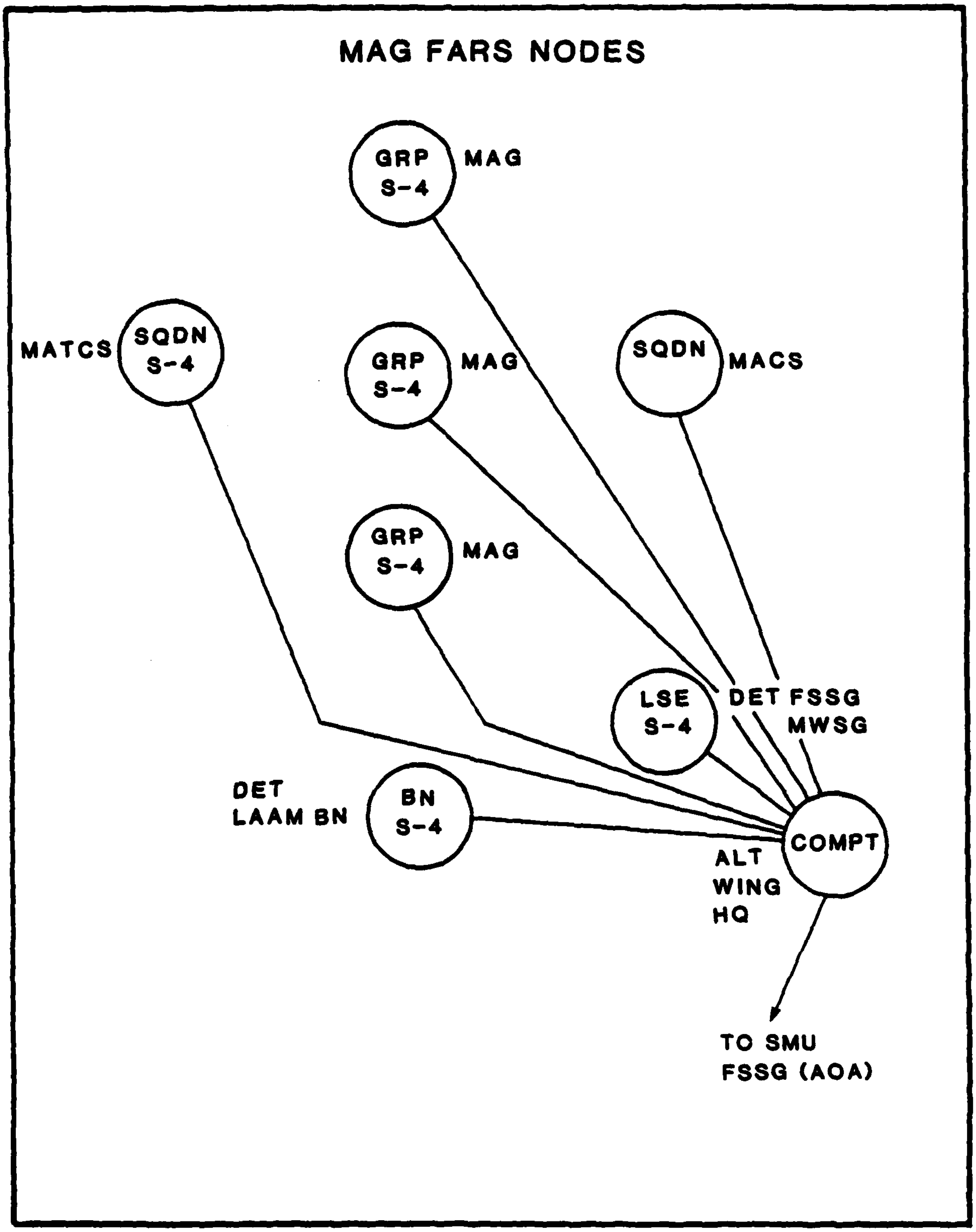


Figure C-65. MAG FARS Nodes D-Day to D+11 (TAE)

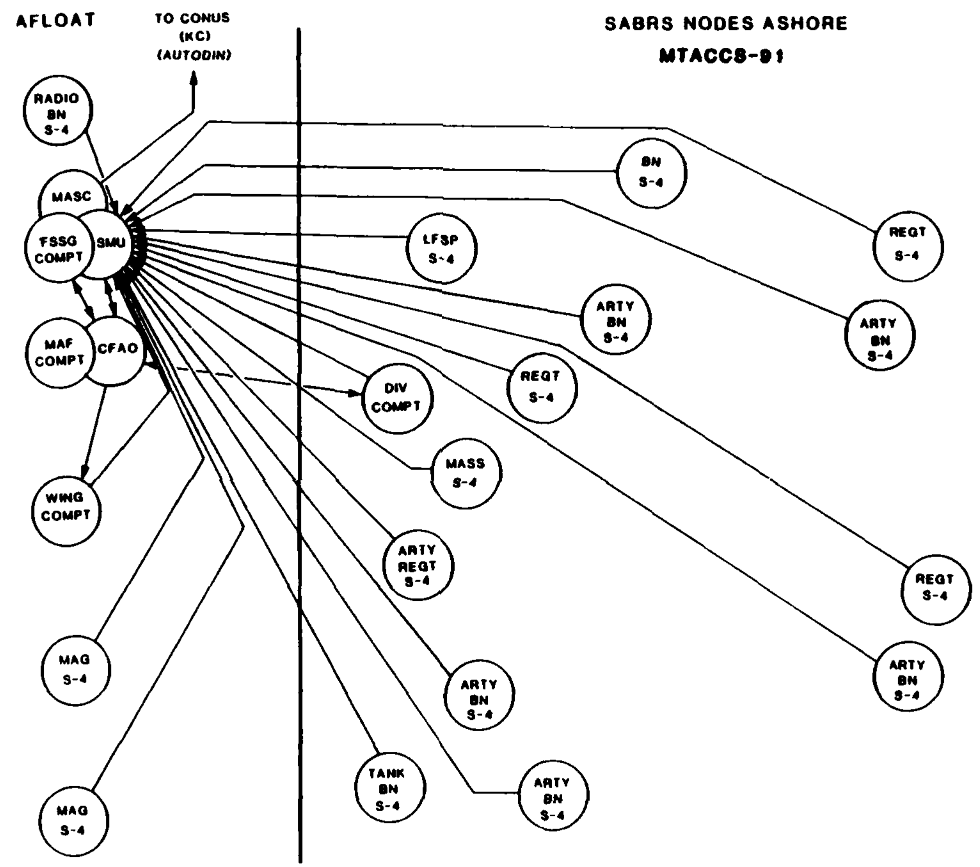


Figure C-66. SABRS Nodes D-Day (AOA)

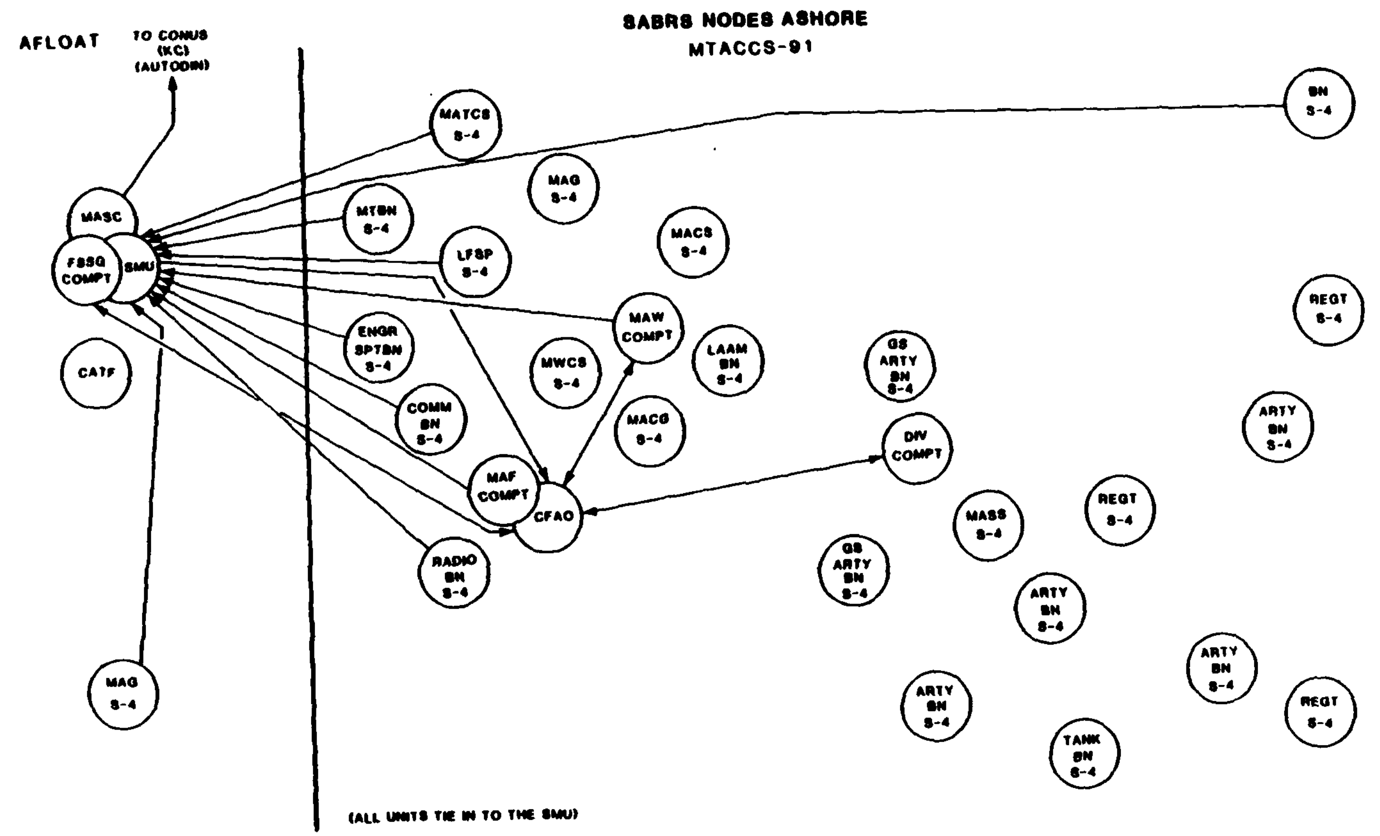


Figure C-67. SABRS Nodes D+5 (AOA)

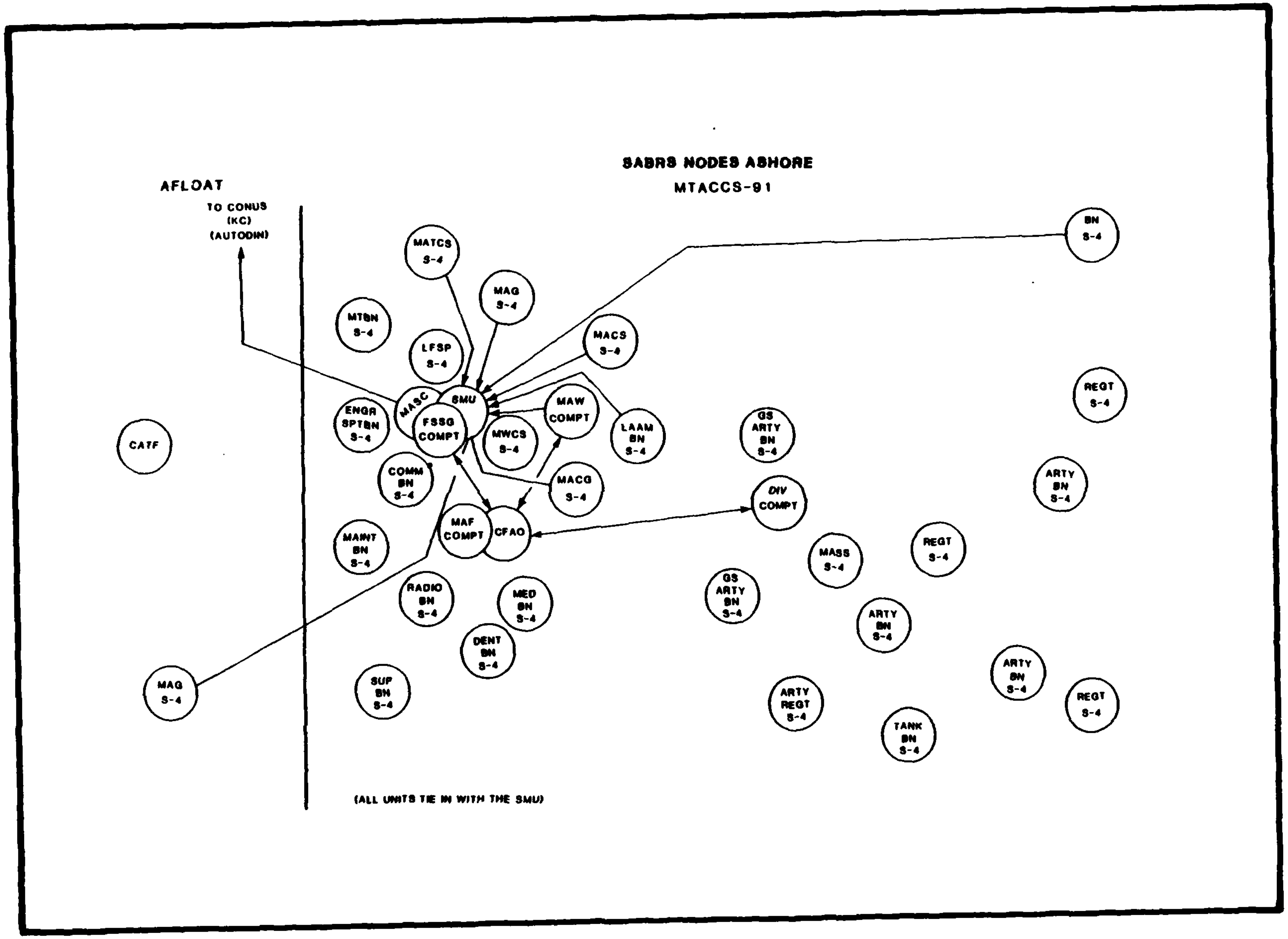


Figure C-68. SABRS Nodes D+11 (AOA)

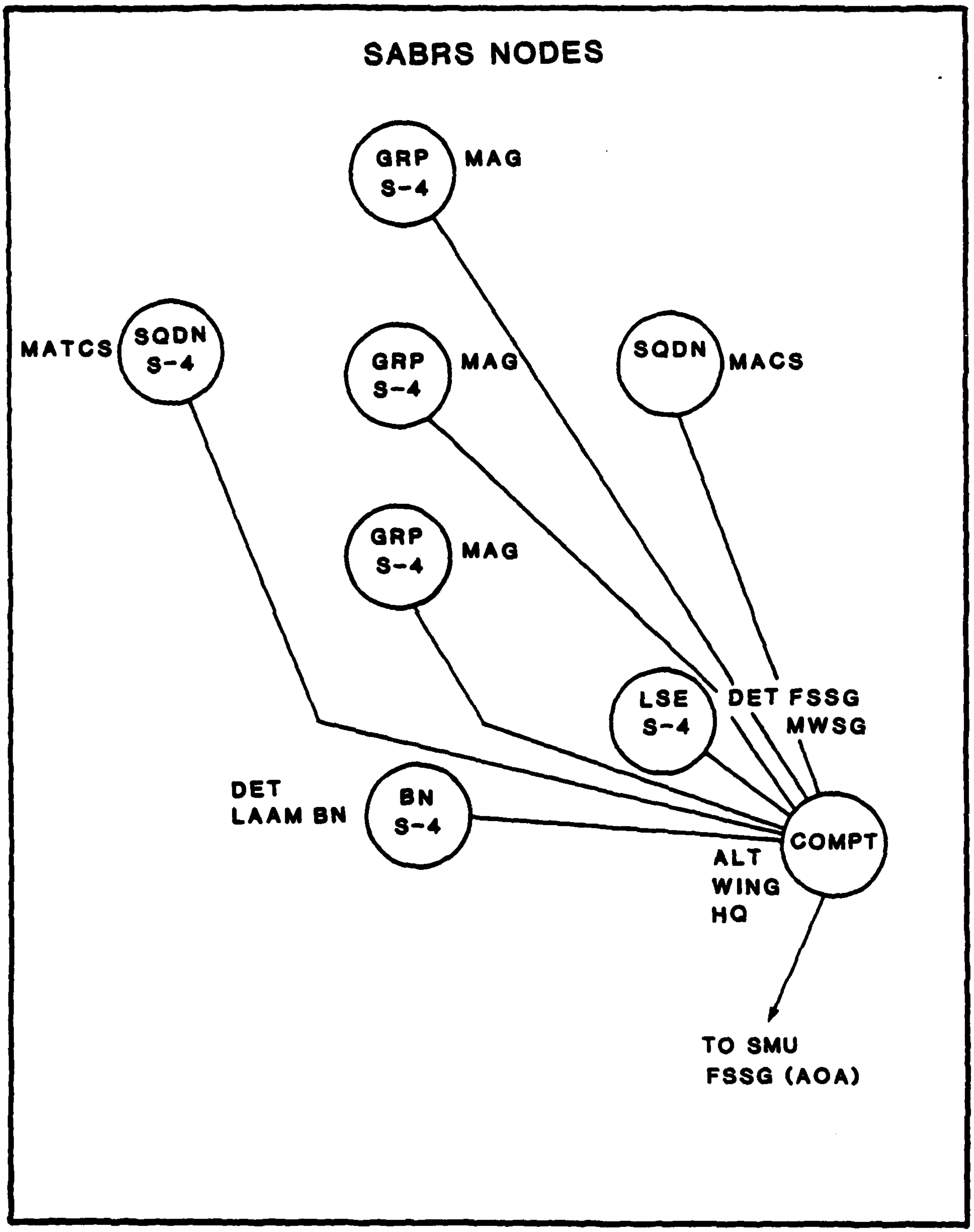


Figure C-69. SABRS Nodes D-Day to D+11 (TAE)

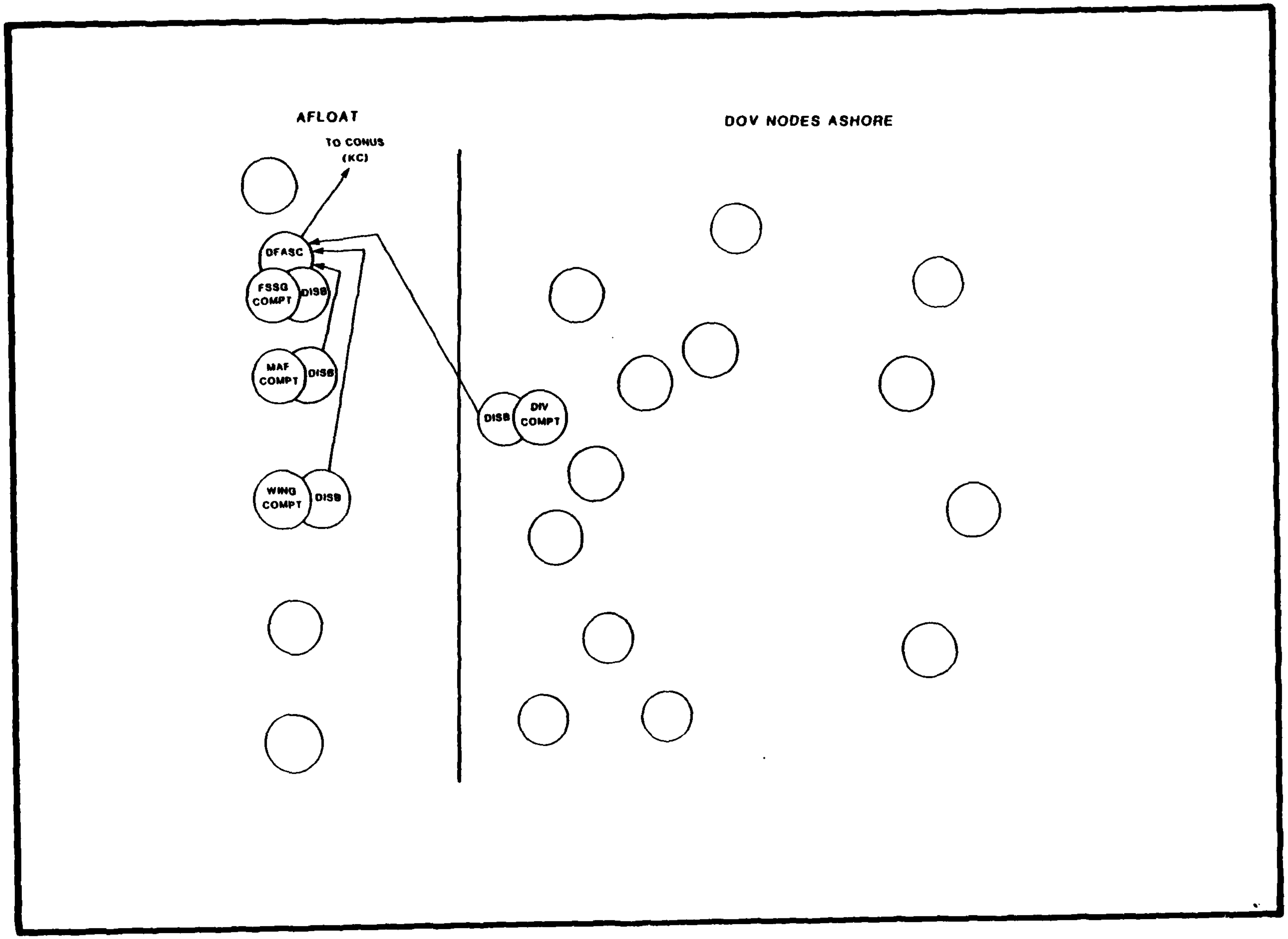


Figure C-70. DOV Nodes D-Day (AOA)

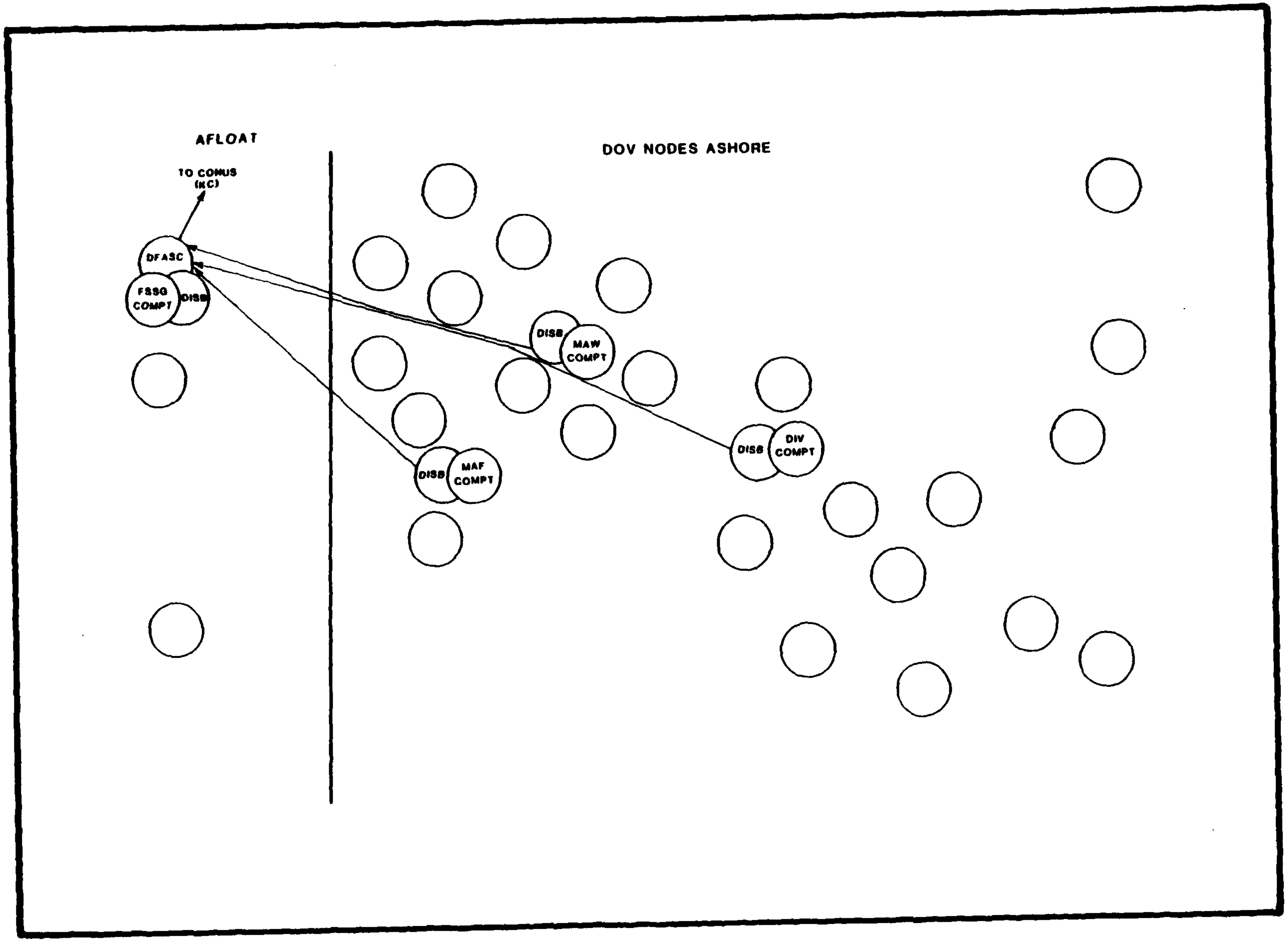


Figure C-71. DOV Nodes D+5 (AOA)

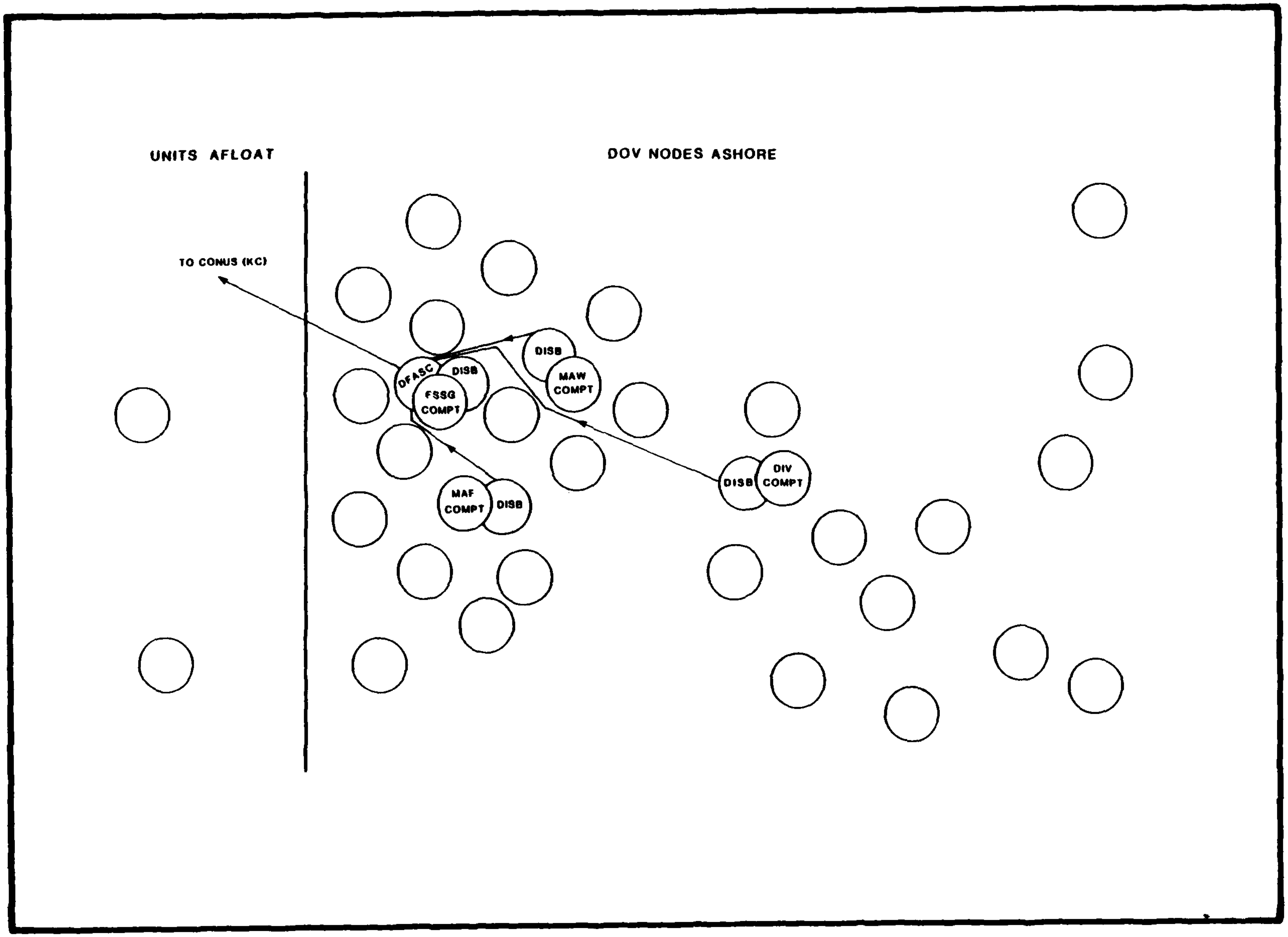


Figure C-72. DOV Nodes D+11 (AOA)

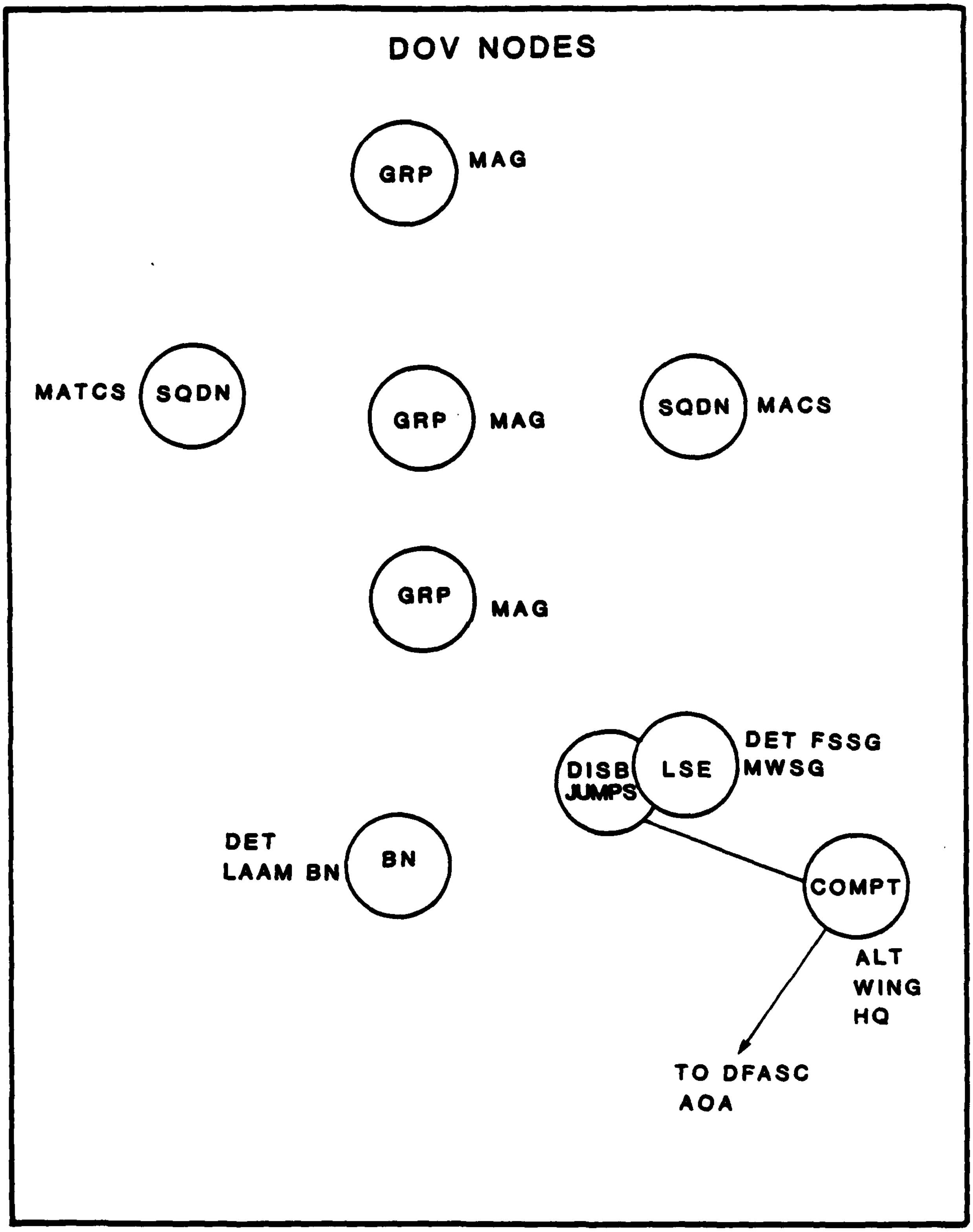


Figure C-73. DOV Nodes D-Day to D+11 (TAE)

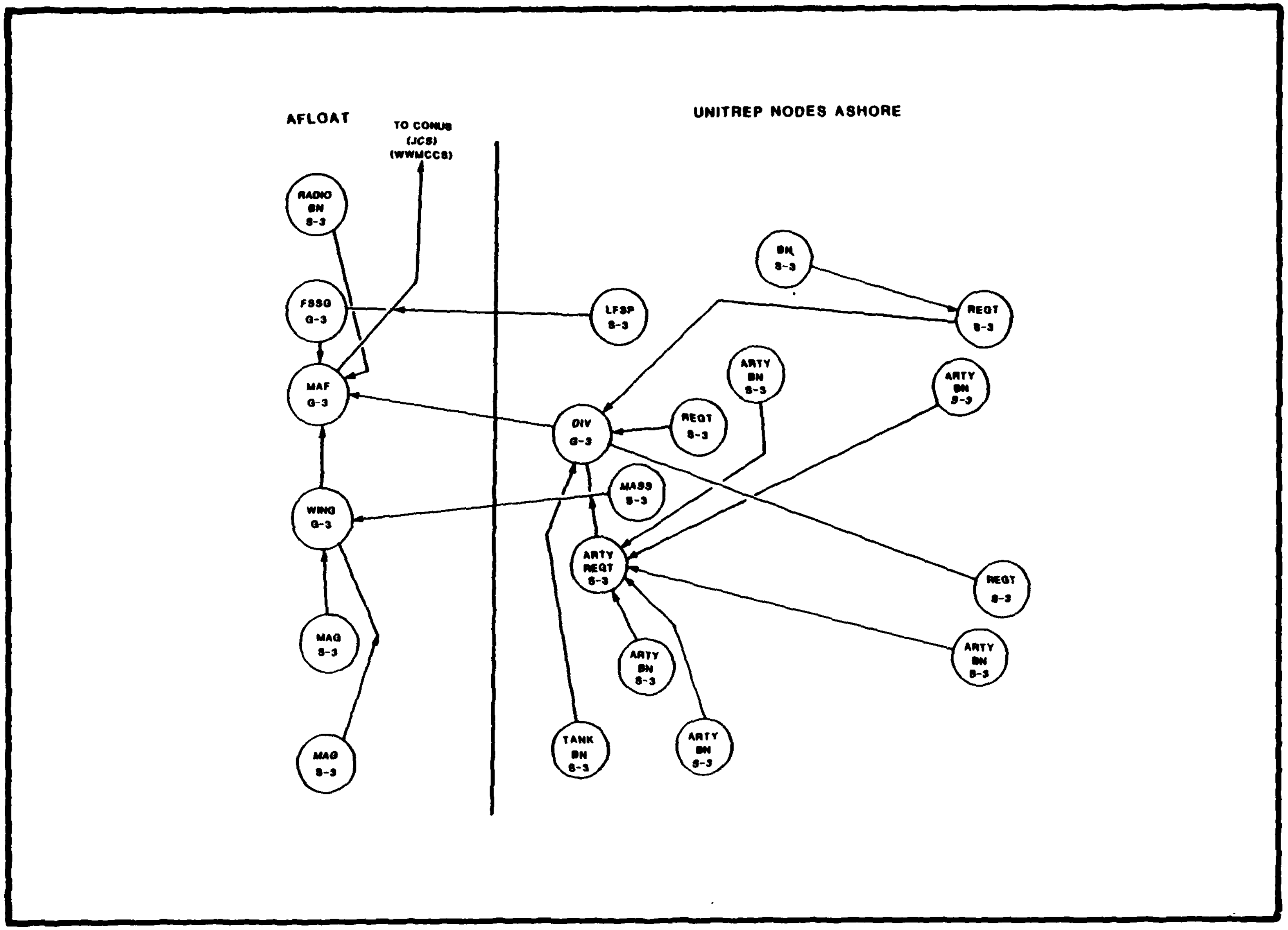


Figure C-74. UNITREP Nodes D-Day (AOA)

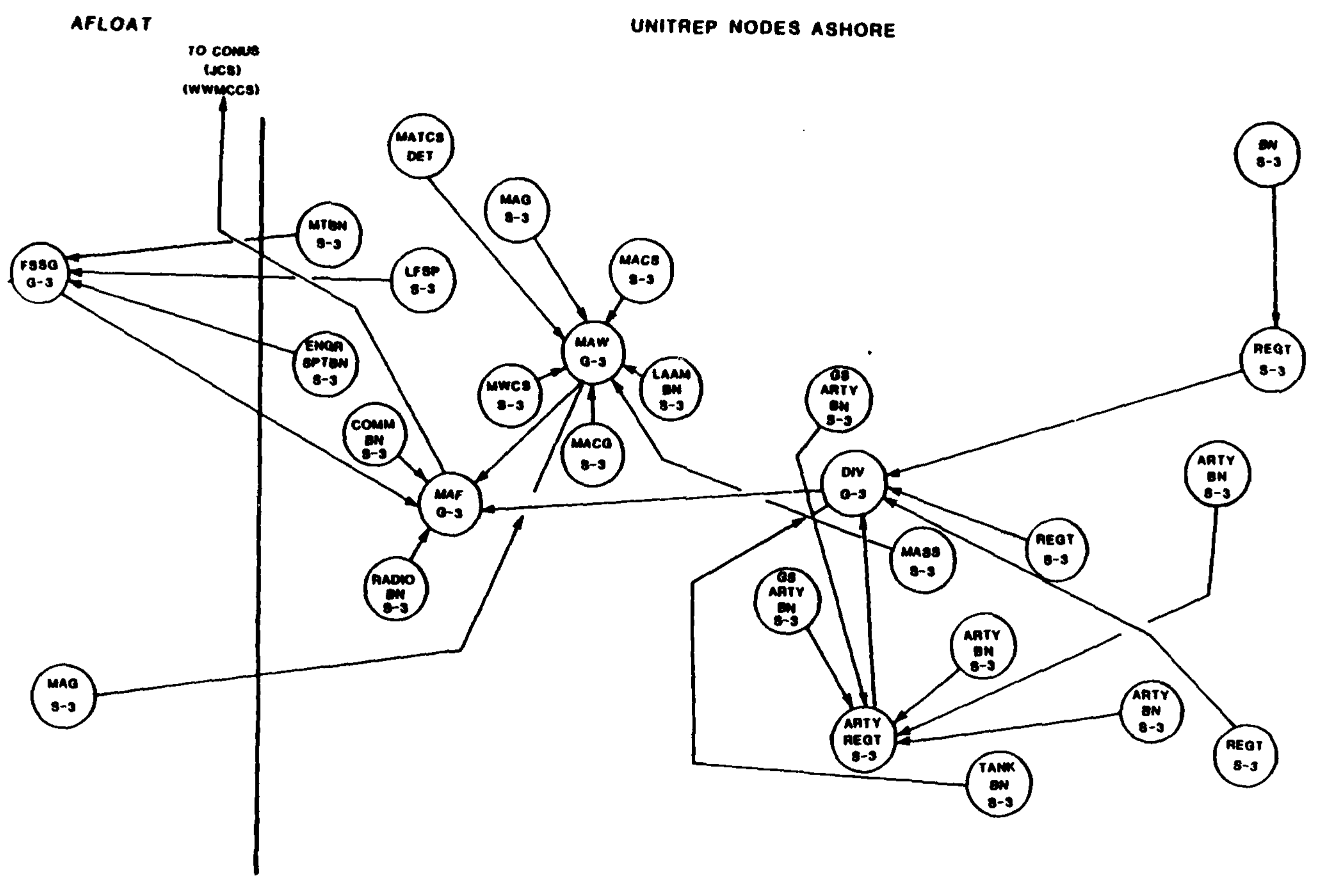


Figure C-75. UNITREP Nodes D+5 (AOA)

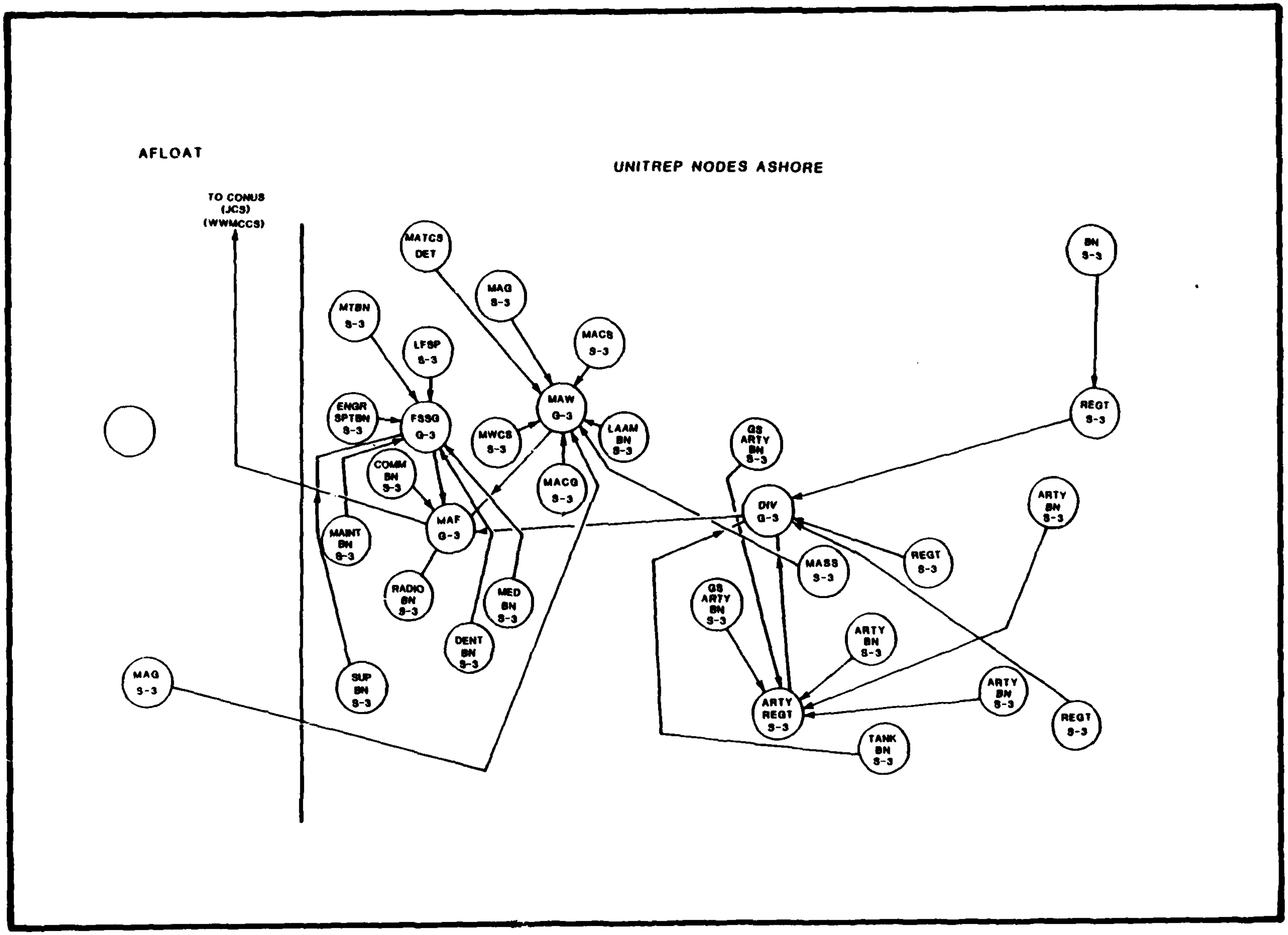


Figure C-76. UNITREP Nodes D+11 (AOA)

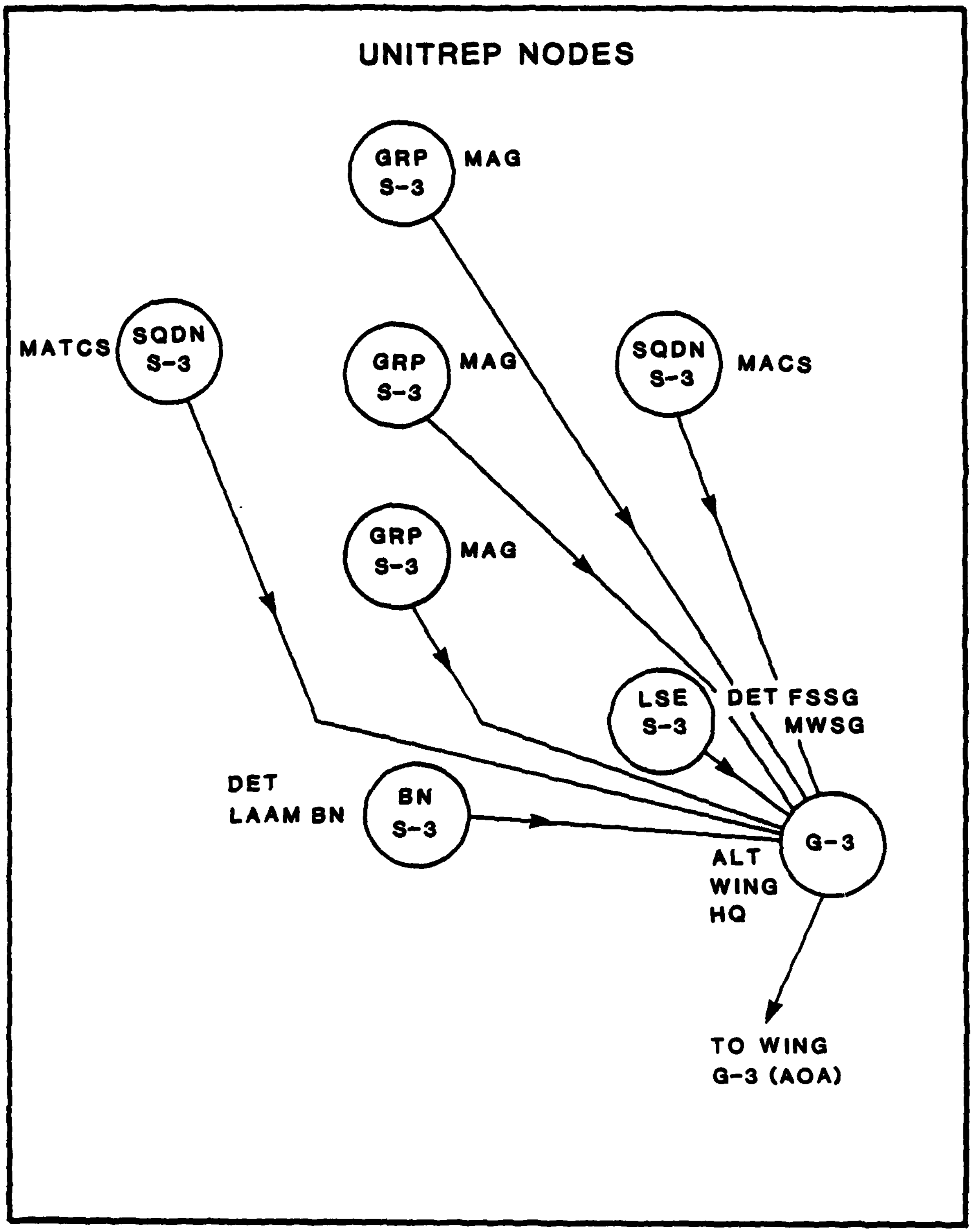


Figure C-77. UNITREP Nodes D-Day to D+11 (TAE)

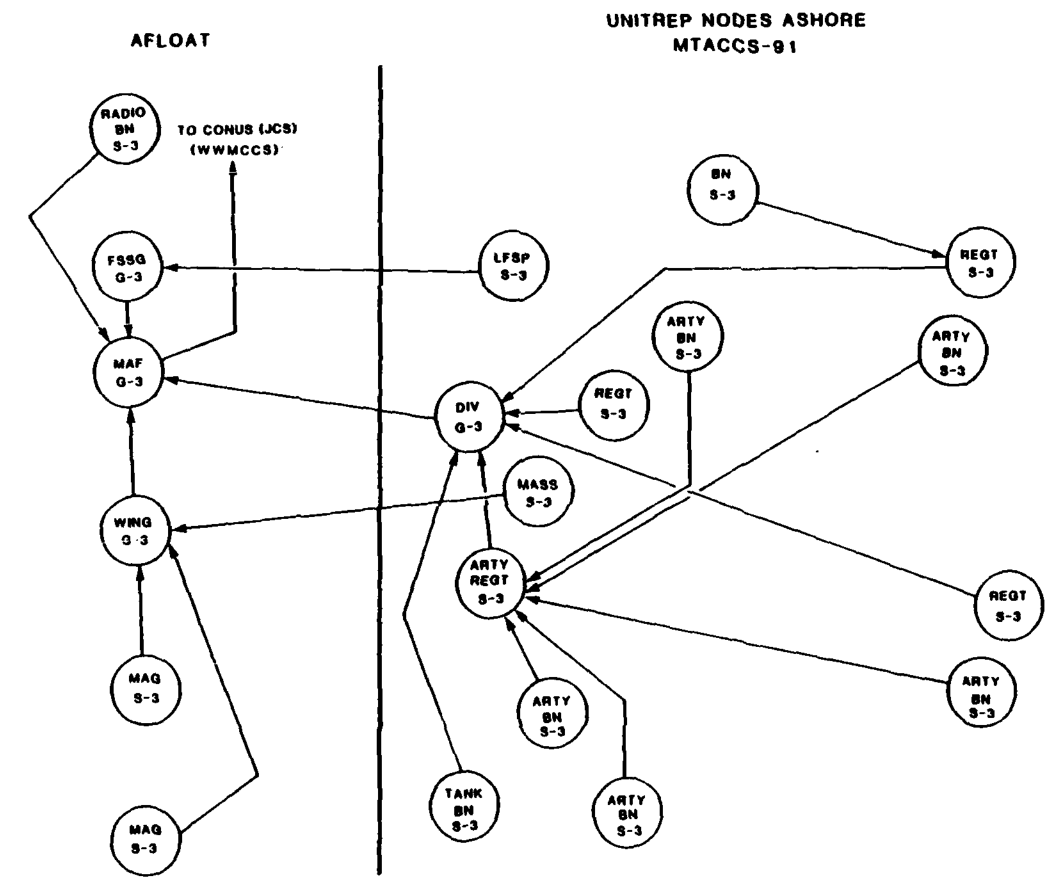


Figure C-78. UNITREP Nodes D-Day (AOA MTACCS)

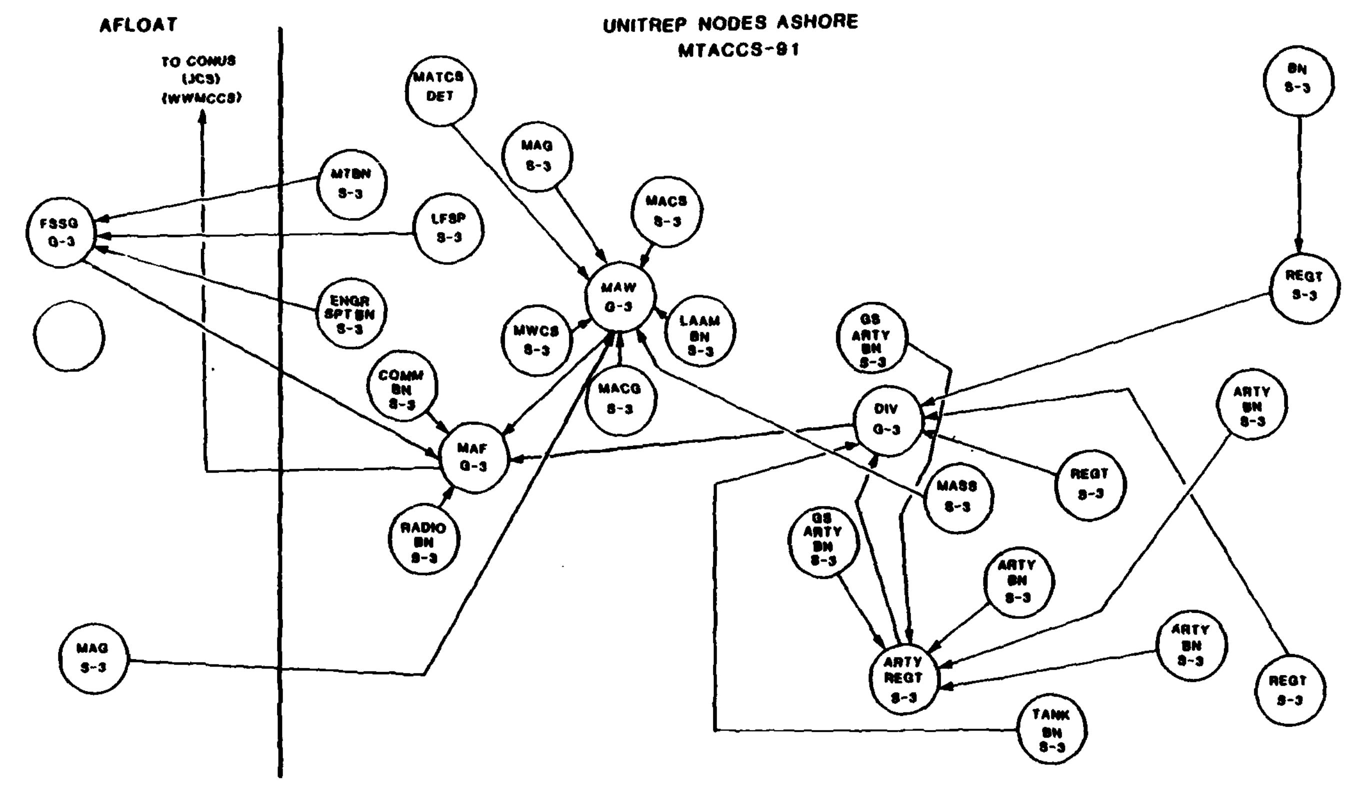


Figure C-79. UNITREP Nodes D+5 (AOA MTACCS)

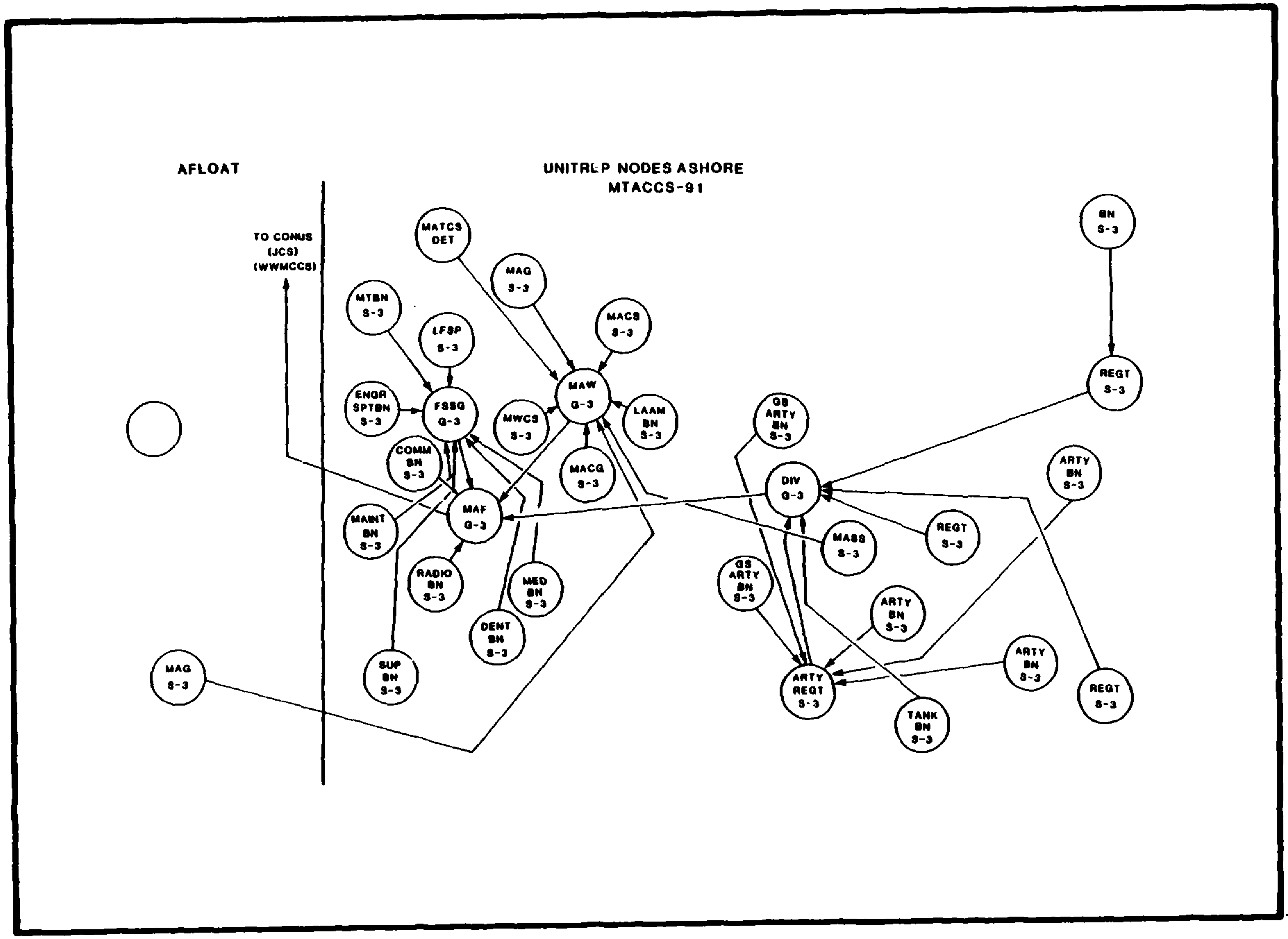


Figure C-80. UNITREP Nodes D+11 (AOA MTACCS)

APPENDIX D

GLOSSARY

GLOSSARY

AAV	Assault Amphibious Vehicle
AAWC	Anti-Air Warfare Center
ABN	Artillery Battalion
A/C	Aircraft
ACU	Administrative Control Unit
ADP	Automated Data Processing
ADPE	Automated Data Processing Equipment
AE	Assault Echelon
AFOE	Assault Follow on Echelon
AIS	Automated Information System
AISOPFAC	Automated Information System Operational Facility
ALT	Alternate
ANDVT	Advanced Narrowband Digital Voice Terminal
AO	Aerial Observation
AOA	Amphibious Objective Area
ART	Artillery Regiment
ARTY	Artillery
ASRT	Air Support Radar Team
AUTODIN	Automatic Data Information Network
AVN	Aviation
AW	All Weather
B&P OPS CO	Beach and Port Operations Company
BCC	Battery Control Center
BLT	Battalion Landing Team
BN	Battalion
BSA	Beach Support Area
BTRY	Battery
C^2	Command and Control
C^2MP	Command and Control Master Plan
C^3	Command, Control and Communications
C^4	Command, Control, Communications and Computers
CAEMS	Computer Aided Embarkation Management System
CATF	Commander Amphibious Task Force
CBT	Combat
CDPA	Central Design and Programming Activity
CFAO	Consolidated Fiscal Accounting Office
CIC	Combat Information Center
CID	Combat Information/Detection
CI TMS	Counterintelligence Teams

CIV AFF GRU	Civil Affairs Group
CLF	Commander Landing Force
CMD	Command
COC	Combat Operations Center
COE	Concept of Employment
COMM	Communications
COMMCON	Communications Control
COORD	Coordination
COMPT	Comptroller
COMSEC	Communications Security
CP	Command Post
CSS	Combat Service Support
CU	Common User
DAS	Direct Air Support
DASC	Direct Air Support Center
DBMS	Data Base Management System
DCE	Digital Communications Equipment
DCT	Digital Communications Terminal
DD	Data Dictionary
DDN	Defense Data Network
DENT BN	Dental Battalion
DET	Detachment
DFASC	Deployable Force Automated Services Center
DIV	Division
DNVT	Digital Non-Secure Voice Terminal
DOA	Days of Ammunition
DOS	Days of Supply
DOV	Disbursing Officer Voucher
DS	Direct Support
DSU	Direct Support Unit
DSVT	Digital Subscriber Voice Terminal
DWTS	Digital Wideband Transmission System
ECCM	Electronic Counter-Counter Measures
ENGR	Engineer
ESI	Electrospace Systems, Inc.
EUCE	End User Computer Equipment
EXT	External
FAAD	Forward Anti-Air Defense
F/C	Flag Command
FD	Fire Direction
FDC	Fire Direction Center
F/DUX	Full Duplex
FEP	Front End Processor
FIE	Fly-In Echelon

FMF	Fleet Marine Force
FMFM	Fleet Marine Force Manual
FMSS	Field Maintenance Subsystem
FOCS	Fiber Optic Cable System
FOMS	Fiber Optic Multiplexing System
FOR RECON CO	Force Reconnaissance Company
FREDS	Flight Readiness Evaluation Data System
FSCC	Fire Support Coordination Center
FSSG	Force Service Support Group
FY	Fiscal Year
GRP	Group
GS	General Support
H&HS	Headquarters and Headquarters Squadron
H&S CO	Headquarters and Service Company
HD	Helicopter Direction
HDC	Helicopter Direction Center
H/DUX	Half Duplex
HF	High Frequency
HFCT	High Frequency Communications Terminal
HMSS	Headquarters Maintenance Subsystem
HQ	Headquarters
HR	Helicopter Request
HST	Helicopter Support Team
HW	Hardware
Hz	Hertz (Cycles per second)
IAC	Intelligence Analysis Center
IATC	Itinerant Air Traffic Control
IC	Intelligence Center
ICDL	Inter Center Data Link
IHFR	Improved High Frequency Radio
II	Imagery Interpretation
INTEL	Intelligence
IOC	Initial Operational Capability
IP	Image Processing
IRT	Infantry Regiment
ISIS	Integrated Signal Intelligence System
ISMO	Information Systems Management Officer
JCS	Joint Chiefs of Staff
JIC	Joint Intelligence Center
JUMPS	Joint Uniform Military Pay System

Kbps	Kilo Bits per Second
LAAM	Light Anti-Air Missile
LAV	Light Armored Vehicle
LDG	Landing
LF	Landing Force
LFICS	Landing Force Integrated Communications System
LFSP	Landing Force Shore Party
LOC	Logistics Operations Center
LOG	Logistics
LZ	Landing Zone
M3S	Marine Corps Standard Supply System
MAB	Marine Amphibious Brigade
MACG	Marine Air Control Group
MACS	Marine Air Control Squadron
MAF	Marine Amphibious Force
MAG	Marine Aircraft Group
MAGIS	Marine Air-Ground Intelligence System
MAGFARS	Marine Air-Ground Financial and Reporting System
MAGTF	Marine Air-Ground Task Force
MAINT	Maintenance
MAR DIV	Marine Division
MASC	MAGTF Automated Services Center
MASD	Multiple Agency Sequence Diagram
MASS	Marine Air Support Squadron
MATCALS	Marine Air Traffic Control and Landing System
MATCS	Marine Air Traffic Control Squadron
MAU	Marine Amphibious Unit
MAW	Marine Aircraft Wing
MCDN	Marine Corps Data Network
MCLB	Marine Corps Logistics Base
MCSS	Multi-Channel Switching System
MCTSSA	Marine Corps Tactical Systems Support Activity
MED BN	Medical Battalion
MENS	Mission Element Need Statement
MEPS	Message Entry Processing System
MIFASS	Marine Integrated Fire and Air Support System
MILOGS	Marine Integrated Logistics System
MIMMS	Marine Corps Integrated Maintenance Management System
MIPS	Marine Integrated Personnel System
MIS	Management Information System
MLRP	Marine Corps Long Range Plan

MMROP	Marine Corps Mid-Range Objectives Plan
MMS	Manpower Management System
MMU	Maintenance Management Unit
MPS	Maritime Prepositioning System
MTACCS	Marine Corps Tactical Automated Command and Control Systems
MT BN	Motor Transport Battalion
MUX	Multiplex
MWCS	Marine Wing Communications Squadron
MWSG	Marine Wing Support Group
NALCOMIS	Naval Aviation Logistics Command Management Information System
NAMSO	Naval Aviation Materiel Support Office
NGF	Naval Gunfire
OPFAC	Operational Facility
OPS	Operations
OT&E	Operational Testing and Evaluation
PCM	Pulse Code Modulation
PGRG	Potomac General Research Group
PLRS	Position Location Reporting System
POW	Prisoner of War
PWR	Prepositioned War Reserve
PX	Post Exchange
RASC	Regional Automated Services Center
REAL FAMMIS	Real Time Financial & Manpower Management Information System
RECON	Reconnaissance
REGT	Regiment
RJE	Remote Job Entry
RLT	Regimental Landing Team
ROC	Required Operational Capability
RT	Real Time
RU	Reporting Unit
SABRS	Standard Accounting Budgeting and Reporting System
SACC	Supporting Arms Coordination Center
SAR	Search and Rescue
SASSY	Supported Activities Supply System
SCA	Supply Control Activity

SEMS	Standard Embarkation Management System
SI	Special Intelligence
SINCGARS	Single Channel Ground-Air Radio System
SMU	Sassy Management Unit
SOP	Standard Operating Procedure
SP	Shore Party
SPT	Support
SQDRN	Squadron
SSCC	Special Security Communications Center
SSCT	Special Security Communications Team
SSES	Ship's Signal Exploitation Space
STAJ	Short Term Anti-Jam
SUADPS	Shipboard Uniform Automated Data Processing System
SUP	Supply
SUP O	Supply Officer
SW	Software
SYSCON	Systems Control
TAC	Tactical Air Command
TACC	Tactical Air Command Center
TACP	Tactical Air Control Party
TAD	Tactical Air Direction
TADC	Tactical Air Direction Center
TADIL	Tactical Digital Data Link
TAE	Theater Airfield Echelon
TAOC	Tactical Air Operations Center
TAOM	Tactical Air Operations Module
TAR	Tactical Air Request
TCC	Tactical Communications Center
TCO	Tactical Combat Operations System
TDL (TADIL)	Tactical Data Link
TDS	Tactical Data System
T/E	Table of Eq ipment
TECH CON	Technical Control
TERPES	Tactical Electronic Reconnaissance Processing and Evaluation System
TF	Task Force
TGT AC BTRY	Target Acquisition Battery
TIC	Technical Interface Concepts
TIDP	Technical Interface Design Plan
TK BN	Tank Battalion
TLOC	Tactical Logistics Operations Center
T/O	Table of Organization

TOPO PLAT	Topographic Platoon
TTY	Teletype
TU	Traffic Units
TWSEAS	Tactical Warfare Simulation Evaluation and Analysis System
UHF	Ultra High Frequency
ULCS	Unit Level Circuit Switch
ULMS	Unit Level Message Switch
UNITREP	Unit Status and Identity Report
VA	Fixed Wing Attack
VF	Fixed Wing Fighter
VH	Helicopter
VHF	Very High Frequency
WPM	Words per Minute
WWMCCS	Worldwide Military Command and Control System
XFR	Transfer

EQUIPMENT IDENTIFICATION GLOSSARY

TAM NO.	"AN" DESIG	NOMENCLATURE
A0010	AN/UYQ-3A	Direct Air Support Central
A0060	AN/TPA-9	ASRT Communications and Maintenance Group
A0080	4110 (ADPE-FMF)	Automated Data Processing Equipment-FMF
A0244	AN/TTC-38	Central Office Telephone, Automatic
A0248	AN/TTC-42	Central Office Telephone, Automatic
A0266	AN/MSC-63A	Tactical Communications Center
A0268	AN/TGC-37	Communications Central
A0280	AN/TYA-11	Communications Central

A0284	AN/UGC-74	Communications Terminal
A0288	AN/TSC-95	Communications System
A0305	AN/TRC-171	Communication Central
A0311	AN/TSQ-84	Communication Technical Control Center
A0437	AN/TYC-5A	Data Communications Terminal
A0498	AN/PSC-2	Digital Communications Terminal (DCT)
A0510	AN/UYQ-4A	Direct Air Support Central
A0656	AN/TSC-96	Satellite Communications Central
A0659	AN/GXC-7A	Tactical Facsimile Set
A0812	AN/TSC-85A	Communication Terminal, Satellite
A0814	AN/TSC-93A	Ground Mobile Forces Satellite Communications Terminal
A0817	GPS	Global Positioning System (GPS) NAVSTAR User Equipment
A0882	JTIDS	Joint Tactical Information Distribution System
A0915	MIFASS	Marine Integrated Fire and Air Support System
A0917	AN/PSC-3	Manpack Satellite Terminal
A1111	AN/TSQ-122	Operations Central
A1229	PLRS	Position Location and Reporting System
A1650	OE-334	Radio Central
A1795	AN/GRC-193	Radio Set
A1815	AN/GRC-160	Radio Set
A1825	AN/GRC-201	Radio Set

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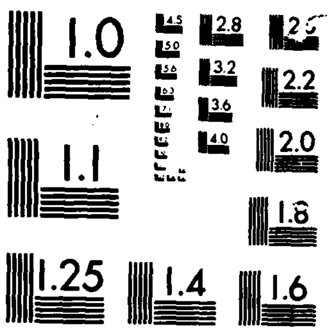

MICROCOP CHART

A1930	AN/MRC-110	Radio Set
A1935	AN/MRC-138	Radio Set
A1955	AN/MRC-139	Radio Terminal Set
A2050	AN/PRC-77	Radio Set
A2065	AN/PRC-104	Radio Set
A2069	AN/PRC-113	Radio Set
A2150	AN/VRC-47	Radio Set
A2179	AN/TRC-170	Radio Terminal Set
A2180	SINCGARS-V	Family of Radios
A2181	AN/GRC-171A	Radio Terminal Set
A2183	AN/MRC-135	Radio Terminal Set
A2189	SRVR	Short Range Vehicular Radio (SINCGARS)
A2190	LRVR	Long Range Vehicular Radio (SINCGARS)
A2480	SB-22	Switchboard, Telephone
A2500	SB-3082	Switchboard, Telephone, Cordless, Automatic
A2505	SB-3614	Switchboard, Telephone
A2506	AN/GYC-7	Switching Set, Message, Automatic
A2508	SB-3865	Switching Unit Telephone, Automatic
A2525	TAOM	Tactical Air Operations Module (TAOC-85)
A2534	TCO	Tactical Combat Operations System
A2645	AN/TGC-46	Teletypewriter Central
A2682	AN/TCC-72	Terminal, Telephone
A3260	AN/VSC-7	Vehicular Satellite Terminal

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